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ELEMENTS OF SURGERY:

BY

ROBERT LISTON,

SURGEON TO THE NORTH-LONDON HOSPITAL, PROFESSOR OF CLINICAL SURGERY,
ETC., ETC., ETC.

FROM THE SECOND LONDON EDITION,

WITH

COPIOUS NOTES AND ADDITIONS,

BY

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MARINE HOSPITAL, ETC., ETC.

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WILLARD PARKER, M. D.,

Professor of Surgery in the College of Physicians and Surgeons in the City of New York,

THIS EDITION OF MR. LISTON'S WORK

Is Inscribed,

AS A TESTIMONIAL OF RESPECT

FOR HIS UNTIRING ZEAL IN SURGICAL PURSUITS,

AND OF ESTEEM FOR HIS PRIVATE VIRTUES,

BY HIS FRIEND AND FORMER COLLEAGUE,

THE EDITOR.

PREFACE

TO THE AMERICAN EDITION.

The character of Mr. Liston's work is too well established to render it necessary for me to say anything in commendation of it. As an outline of surgical science, which is all that can be claimed for it, it is unrivalled in the English language. Written in a bold and graphic style, the distinguished author never hesitates to express his opinion, frankly and fearlessly, of what his judgment and experience have led him to disapprove. In this, as well as in some other particulars, he reminds one forcibly of that great and eccentric surgeon, John Bell. There is no cringing to this man or that, no doubtful or equivocal sentiment, no attempt to theorise or speculate; on the contrary, he comes right out, and clearly tells us what he means. His work, full of vigour and freshness, contains more originality than any other similar publication that has been issued for a long time from the British press. The hand of a master is discernible in every page; and, notwithstanding an occasional incongruity, or *outré* expression, it is impossible to read it without feeling that it is the production of a great mind, thoroughly acquainted with the subject on which he treats.

Such a work is invaluable to the student; for, independently of imparting sound surgical knowledge, it does more to form his judgment, and to qualify him for the practical duties of his profession than all the compilations in Christendom. Velpeau, with all his learning and all his patience, has never furnished anything equal to it. His "*Medicine Operatoire*" is nothing but a vast storehouse of research, to which pompous doctors may resort for ancient lore, and prosing teachers for materials for instruction. It details with endless minuteness the operative methods of every surgeon, great or little, from the age of Hippocrates to the present period, with their various modifications and improvements, not forgetting the "appreciations" and labours of the able professor himself. Such productions are well enough in their way; they serve to give us an idea of the rise and progress of surgery, and form good books of reference. Beyond this, however, they are of comparatively little utility; the great mass of the profession is no more benefited by them than if they had never been written; few read them, and still fewer understand them. This attempt at erudition pervades, if I mistake not, almost every recent publication on surgery in the French language. Dupuytren is alone free from it. His writings breathe throughout a different and more independent spirit: he speaks like one accustomed to act and to think for himself; and the result is, that he has accomplished more for French surgery than any other Frenchman since the days of Ambrose Paré.

The first edition of the present Treatise was published at Edinburgh in 1831, some time prior to the author's removal to London. It was originally comprised in three volumes. A second impression, of which this is a reprint, appeared at London in 1840, in a revised and improved form. The favourable reception which the publication has met with in this country, and the desire I have felt to introduce it into the school with which I am connected, as a text-book, have induced me to prepare it for the American press with particular care. Among the additions, properly so called, is an article on Strabismus, and another on Club-foot; two subjects, the former of which was entirely omitted in the English edition, and the latter discussed in a manner altogether incommensurate with the existing state of our knowledge in regard to it. The notes are designed to serve as further illustrations of the text, or to supply deficiencies in relation to certain topics which have been passed lightly over by the author. They might have been extended to almost any number, and it would have afforded me no ordinary gratification, had it been consistent with the views and interests of my publishers, to present what might be considered as a tolerably fair outline of American surgery. For such an object ample materials are extant, highly valuable in themselves, and eminently calculated, when they shall be properly embodied, to reflect credit upon the talents, enterprise, and dexterity of our surgeons.

It need hardly be added, what is self-evident, that the editor of a work is responsible to the public only so far as his own labours are concerned. He adopts only in a general manner, without endorsing all, the views and opinions of his author.

S. D. GROSS.

Louisville Medical Institute,
May, 1842.

PREFACE.

The rapid advancement made in the pathology and treatment of surgical diseases demands a perpetual revision and correction of the systematic works devoted to this department of the healing art.

Accordingly, text books, various in merit and extent, have emanated from the different schools. Several of these have, by successive editions, kept pace with the science; whilst others have fallen into disuse.

In this part of Britain, the systems of Latta, B. Bell, and Allan, occupied the field; but it being now vacant, I venture to supply the deficiency, by reducing the heads of my lectures into a compendium, or guide, for those students who resort to this city.

It must appear superfluous to preface such a work by anatomical descriptions, anatomy being now studied more generally, and with greater zeal, than heretofore. Pathology also is more attended to, and better understood. To which circumstances are to be ascribed the improvements in surgical science, as well as in the art of operating.

The functions and structure of parts are more frequently preserved uninjured — mutilation is more rarely required — and operations are dispensed with. The wider the extension of pathology, the fewer the operations will be — thus affording the best criterion of professional attainment. Who will question, that there is more merit in saving one limb by superior skill, than in lopping off a thousand with the utmost dexterity?

To treat surgical diseases as they ought to be treated, the practitioner must be thoroughly acquainted with the healthy and morbid structure; he must also have a mind vigorous and firm from nature, well instructed in the best precedents, and matured by observation.

Years are not the measure of experience. It does not follow, that the older the surgeon is, the more experienced and trustworthy he must be. The greatest number of well-assorted facts on a particular subject constitutes experience, whether these facts have been culled in five years or in fifty.

It is only from experience, directed and aided by previous study, that accuracy of diagnosis and celerity of decision can be acquired. Besides knowing in what manner to proceed, the surgeon must know well wherefore he acts, and also the precise time at which he should interfere. With knowledge and confidence derived from experience, he will perform such operations as are indispensable for the removal of pain and deformity, or for the preservation of life, with calmness and facility — with safety to his patient, and satisfaction to those who assist in, or witness, his proceedings.

Attention to the apparatus is necessary. It should be in good order, simple, and ample. The young surgeon should note down, previously to an operation, whatever, on reflection, can possibly be required. "For in most capital operations, unforeseen circumstances will sometimes occur, and must be attended to; and he who, without giving unnecessary pain from delay, finishes what he has to do in the most perfect manner, and that most likely to conduce to his patient's safety, is the best operator."

It is seldom necessary to employ much preliminary treatment. From the usual preparative course of bleeding, purging, cooling diet, etc., patients about to undergo capital operations, as lithotomy, suffer more than they can gain.

It is of the utmost importance to attend to the state of the patient's mind and feelings. He ought not to be kept in suspense, but encouraged and assured; and his apprehensions must be allayed. If this cannot be effected — if he is dejected and despondent — talks of the great risk, and of the certainty of his dying, it is better that the operation be abandoned, or at least delayed. If, on the contrary, he is confident in the resources of his constitution, and in the ability of his attendant, and looks forward to the advantage to be derived from his own fortitude, then should there be no delay.

A mild laxative may be given, when an empty state of the bowels is desirable, or when they, by acting too soon afterwards, might put the patient to inconvenience or pain, or interrupt the curative process.

Attention to after-treatment is of much greater importance. The practitioner is not to rely on success, however well the manual part has proceeded. He must consider his labour only begun, when the operation has finished; the patient is yet to be conducted, by kindness and judgment, through the process of cure.

It is thus only that difficult and unpromising cases can be brought to a happy conclusion, and favour and lasting reputation gained.

In the present work an endeavour has been made, in the first place, to lay down, correctly and concisely, the general principles which ought to guide the practitioner in the management of constitutional disturbance, however occasioned.

The observations introduced to illustrate the doctrines inculcated are given as briefly as is consistent with an accurate detail of symptoms and results. The descriptions of particular diseases have been sketched and finished from nature; and, it is hoped, with such fidelity, that their resemblance will be readily recognised.

To describe all the methods recommended and followed, in the different surgical operations, would occupy more space than can be allotted in an elementary work — would, without answering any good purpose, lead into the wide range of the history and progress of surgery.

Such modes of operating are described as have been repeatedly and successfully performed by the Author.

If by clear and simple description of the phenomena attendant on morbid action, and of the changes which it produces, — if by plain rules for the treatment of the diseases, and performing the operations for their alleviation or cure, — he contribute to the progress of surgery, and the consequent diminution of human misery, he will consider himself fully rewarded for the time and the labour spent on this production.

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ELEMENTS OF SURGERY.

PART FIRST.

OF INFLAMMATION.

There are few accidents or diseases, to which the human body is liable, which are not preceded or followed by incited action, increased circulation, and accumulation of blood in the capillary vessels of the part affected; and these phenomena require to be very attentively studied, and correctly understood, by all who propose practising the healing art. As all the salutary as well as diseased processes which occur in the human body are more or less attended or affected by this action, and as its regulation forms a principal part of the duty of the surgical practitioner, this work cannot be more properly commenced than by treating of its nature, consequences, and management.

Inflammation may be defined to be, an unnatural or perverted action of the capillary bloodvessels of an organ or part of the body, attended with redness, throbbing, swelling, pain, heat, and disorder of function, as well as with more or less disturbance of the system.

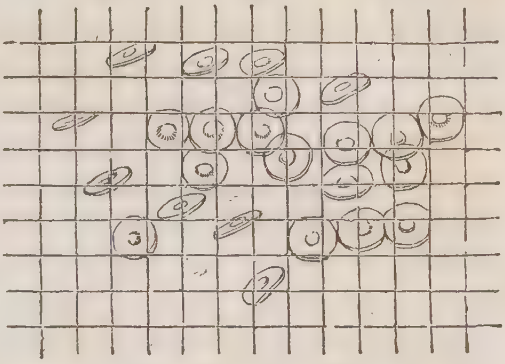
Every part of the body is liable to inflammation; and some writers have divided this action into different kinds, according to the particular tissue which it chiefly involves. But it appears to be always of the same character, though modified by various circumstances, such as the tissue in which it occurs, the state of the constitution, the exciting cause, and the intensity of the action.

The usual division of the subject, into *Acute* and *Chronic*, is that which it is here proposed to adopt. The term Chronic Inflammation is more properly applicable to a consequence of the Acute: but it is at the same time true, that morbid actions proceed more slowly in some constitutions, and in some parts of the body, than in others; and that changes of structure and morbid products, such as generally result from inflammatory action, even occasionally occur, without the prominent symptoms of inflammation being experienced by the patient or detected by the practitioner.

The term *Morbid* is used in contradistinction to what is called *Healthy* Inflammation; but inflammatory action is generally connected, more or less, with a diseased or disordered state of some part of the body. In many circumstances it is highly necessary that a certain degree of incited action of the vessels should occur, and continue for a certain time; as during the uniting of fractures, the adhesion of wounds, and the healing of some sores — and thus far it is healthful: when, however, the action becomes excessive, it must, for this reason, be considered morbid, as it frustrates the natural reparative process; if the action, in fact, proceeds farther than is necessary for reparation, it becomes a disease, and leads to absorption or destruction of parts. In animals possessing the greatest powers of reparation, inflammation, it appears, does not take place at all, or is very slight, and scarcely ever proceeds to suppuration.

Redness is the first sign of inflammation to be considered; this is observed, in the living body, on the surface, or at the extremities of those canals which terminate externally. The inflamed conjunctiva affords a conspicuous example of this appearance. In a subject that has suffered from an internal inflammatory attack, a good opportunity is frequently afforded of observing the enlarged and injected state of the vessels on which the red colour depends. But inflammation may have existed to a certain degree, and yet the parts may be pale, from the capillaries having emptied themselves into the veins immediately after the patient's death. The paleness may be also in part caused by the influx of the red globules being impeded immediately after death, or when the patient is in articulo mortis, in consequence of the contraction of the vessels, which is well known to occur at that period.

It has been said that redness is not essential to inflammation; for serous vessels may be altered in size and function by this action, and yet not be sufficiently dilated to receive the red globules of the blood. And, again, that serous vessels may be enlarged so as to admit the red globules; and a part that is colourless when in the healthy state may, in consequence, assume a highly red hue when in an inflamed condition. This may be observed in the cornea lucida, which, when violently inflamed, is pervaded by numerous vessels, visible to the naked eye, distended with red blood, ramifying over the whole of it, and freely inosculating with each other. Some have even supposed that these vessels are newly formed, in consequence of inflammatory action. This opinion is, however, erroneous; as the vessels existed in the cornea previously, and are only increased in size, so as to admit of the accumulation of a sufficient number of red particles to render the vessels visible. The speedy, and, in many cases, instantaneous, appearance of red vessels where they could not previously be observed, decidedly overturns the opinion that new vessels are in such a case formed. New vessels are seldom formed, unless after a breach of structure, or in cases where morbid deposits become vascular. There is no proof of the existence of mere serous vessels in the human body, as any one may ascertain who is accustomed to examine the capillaries with a good microscope. Vessels which are so small as to admit only a very few, say one, or at most two rows of globules, would, of course, appear colourless, and these are what have been called serous vessels. The globules of blood are so small as to be invisible to the naked eye; and vessels carrying only one series of them would appear colourless. No vessels belonging to the sanguiferous system have ever been observed less in character than a blood globule; and this, so far as I have been able to observe, is, as nearly as possible, $\frac{1}{3000}$ part of an inch. They appear to be flattened discs; and whether those of the human body have a central nucleus or not, seems, as yet, very doubtful. The globules are here shown upon a scale of $\frac{1}{4000}$ part of an inch, linear, and in different positions. They are represented, as seen in the greater number of microscopes, having a central nucleus. Whether, in the blood of mammiferous animals, or not, this is an optical deception, is not very clearly made out; but in that of reptiles the nucleus is easily demonstrable. The redness then is not from error loci, or in consequence of red particles flowing where none flowed before, but from the capillaries becoming distended and dilated with an unusual quantity of blood, which is stagnated in the central part of the inflamed neighbourhood, the inflammatory focus.



Throbbing, to a greater or less degree, is always felt in an inflamed part by the patient; and it is frequently so distinct as to be readily perceived by an attentive examination. This arises, probably, from the stagnation of blood in the vessels of the part over-excited, and principally affected by the disease or injury, causing an increase in the collateral circulation; and it is this rapidly increased action around that gives rise to the signs and symptoms, and constitutes, in point of fact, what is known and recognised as inflammation. The sensation of throbbing is not, however, produced entirely by the action of the capillary vessels, but in consequence, also, of the larger trunks in the neighbourhood sympathising with these capillaries, and so having their action increased also. The obstruction of the capillaries in the early stage of inflammation must necessarily cause a greater force of the heart to be expended on the trunks leading to such capillaries; hence the greater impulse and velocity of blood in the circumferential and patent vessels. In fact, when the inflammatory action is extensive or severe, or when the part affected is of much importance to life, the whole circulating system is disturbed, and thus arises the sympathetic excitement of the constitution.

The incited action of those vessels in the more immediate vicinity of the inflamed part is well marked in cases of Paronychia. There the digital, the radial, and ulnar arteries, with their branches, beat more violently than usual; and with much greater force, though not more rapidly, than the vessels in other parts of the body.

Swelling is caused by the enlarged and overloaded vessels relieving themselves by effusion of part of their contents into the surrounding cellular texture. The effusion varies in extent and consistence, according to the degree of inflammatory action, and the species of resistance offered; at first it is serous, then mixed with fibrin, and consequently spontaneously coagulable. *Cæteris paribus*, the greater the resistance, the less the effusion, and the more violent the inflammatory action; the chance of its speedy and favourable termination is also more diminished. Even the enlargement of the bloodvessels produces a certain degree of intumescence previous to effusion. The relief to the vessels by effusion giving rise to swelling, when it occurs in loose cellular tissues, may be considered as a beneficent provision of nature. But in vital organs it may be productive of the most serious consequences; as in these, very slight effusion will often endanger the structure of the organ, destroy its functions, and not unfrequently be attended with fatal consequences.

The nature of the effused fluid varies according to the degree of violence and advancement of the action, and is also modified by the texture in which that action occurs. It may consist of serum, lymph, blood, or pus. In inflammation, in short, exhalation, though at first diminished, is soon much increased, whilst the powers of the absorbent vessels are diminished, or at least do not maintain their usual relation to those of the exhalants.

Pain is the next symptom enumerated. Here the very common error of supposing that where there is pain there must always be inflammation may be noticed. Some diseases attended with the most acute pain, as Tic Douloureux and Cramp, are generally unattended with inflammation. Many chronic diseases, too, are accompanied with violent and long-continued paroxysms of pain, without excited circulation of the part.

This erroneous opinion often gives rise to highly prejudicial proceedings, as — the exhausting, by copious depletions, the vital powers of patients, already enfeebled by continued disease or treatment — the consequent aggravation of the urgent symptoms — and, the then only termination of the disease and of the practice, death.

Again, it is true that we must bleed, in some cases, with the view of preventing the occurrence of inflammation; yet the prophylactic treatment may be carried too far, as in cases of violent injuries, or after severe operations. In these instances, the immediate abstraction of blood, so far from being beneficial, expedites the dissolution of the patient, or at least greatly retards the cure. Pains arising from local irritations are often treated in a similar way, whilst the removal of the cause would be much more likely to restore the natural action of the parts.

Though inflammation does not always accompany the sensation of pain, yet the latter, in a greater or less degree, attends inflammatory action; and, perhaps, it is fortunate that it does so. Because, were it not for the occurrence of pain, the patient's attention would not be directed to the disease; he would continue to use the part as if in health, and the affection would thus be much aggravated. Whereas, according to the existing provision of nature, pain is felt at the commencement of the action, the presence of which the patient is thereby made aware of; and he is compelled to employ such measures for its removal as reason naturally dictates, of which none is more effectual than disusing the affected part. The nerves are thus the safeguards of the various parts of the body in health — their nurses in disease. A part deprived of sensation may be used, even to the destruction of its texture, without producing any impression on the sensorium, and consequently without the animal being conscious of it.

The presence of pain, as a symptom of inflammation, may be easily explained. The connexion of the vascular with the nervous system is very constant and intimate. Their ramifications accompany each other, and are contained in the same cellular sheath; and without the reciprocal influence of each, neither could perform its functions perfectly. By injecting a limb soon after its separation from an animal, and before its vital heat has departed, spasms of all muscles are sometimes produced; showing the intimate connexion between these two systems. This, however, is distinct from the contractions of the muscular fibre produced by the application of stimuli. In the former case, the contractions are universal, and induced through the medium of the nerves. In the latter, the irritability of the fibre is excited.

When the circulation is excited, the nerves accompanying the affected vessels are unusually compressed, and over-stimulated by the circulating fluid, in which, probably, some change takes place, and in this manner unnatural impressions are produced; the nerves themselves are likewise the seat of disease, in consequence of the enlargement of the minute capillaries which permeate them. Over-distension of the coats of the vessels may also be supposed to give rise to painful feelings, independently of any affection of the accompanying nervous trunks.

The degree of pain is generally in proportion to the sensibility of the part when in health; it also depends upon the distensibility of the parts affected, and on the intensity of the inflammatory action. When bones, tendons, &c., which in their uninflamed state are nearly insensible, become inflamed, the pain and suffering are most excruciating, owing to the resistance opposed to the dilatation of the vessels, and the prevention of the effusion by which they naturally relieve themselves.

The kind of pain also varies, in consequence of different modifications in the action causing different impressions on the sensorium. Pain is not always increased in proportion to the natural sensibility of the part; for in some instances the sensibility is rendered much more intense, while in others it is much obtunded.*

The last, and, according to some writers, the only unequivocal symptom of inflammation, is *Heat*. In extravasation of blood into the cellular texture, as under the conjunctiva, there is redness, swelling, and occasionally pain; but at first, and unless the action of the bloodvessels be excited, there will be neither heat nor throbbing. In many internal inflammations heat is much complained of; and in Enteritis it has been considered a pathognomonic symptom.*

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* [In the cellular tissue the pain is acute and throbbing; in the pleura, sharp and lancinating; in the lungs and glandular organs, obtuse and heavy; in the skin, prurient and smarting; in the bones, dull and gnawing. Sometimes it is persistent, sometimes intermittent, sometimes periodical; and occasionally, again, it is felt at parts very remote from the one originally and mainly affected. Of the latter variety we have a familiar instance in the hip-joint disease of children, in which the earliest symptom complained of is pain in the corresponding knee. In hepatitis, the right shoulder is often the seat of the suffering; in cystitis, the head of the penis. — Ed.]

The signs, symptoms, and consequences of inflammation — and amongst others, heat — are modified by the distance of the affected part from the centre of circulation. All actions, healthy as well as morbid, proceed with more vigour in the superior extremities — in the head, the neck, and the trunk, than in the more remote parts of the body; for to the former the blood is transmitted more speedily, if not in greater quantity, and is not so liable to be impeded in its return. Hence an arm may bear up under a severe injury, which, to an inferior extremity, would prove inevitable destruction. The heat, however, of an inflamed part, is generally supposed to be much greater than it really is. The sensation of heat is considerable to the patient, as well as to any observer, whilst the absolute increase of temperature is very slight indeed. It has been proved by the most decided experiments of Mr. Hunter, on the mucous canals of animals, first when in health, and again after violent inflammation had been excited, that little or no variation of temperature can be observed. The elevation of temperature is probably constant, though only amounting to a degree, or even less. As the blood is the source of heat, wherever an increased quantity is circulated, there should, to some extent, be increased heat.

The effects of an incited action of the vessels on the system at large must now be adverted to; or, in other words, that general disturbance in the system which attends inflammatory incitation, and which occurs in a degree proportioned to the power of the exciting cause, and the kind of texture primarily affected. The functions both of the sanguiferous and nervous systems are deranged, producing a state termed Symptomatic or Sympathetic Inflammatory Fever. From some observations of my friend Mr. Gulliver, it is probable that this state is frequently, if not generally, dependent on changes in the blood consequent on inflammation. A sort of decomposition of part of the fluid and vitiation of the remainder; the fibrin being separated and effused into the injured part for the purposes of reparation, while the blood globules are converted into pus in the capillaries, and mixed with the circulating fluid. Thus the presence of pus in the blood may become the proximate cause of fever; but if an outlet to the matter be established, if it be discharged by the occurrence of suppuration in a cavity or on a surface, the case is benefited and the constitution relieved. This points to an important principle in practice. Nature puts it in operation in small-pox, for example — how favourable it is for the pustules to come out, and to what danger is not the patient exposed if they are repelled.

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* [Mr. Hunter endeavoured to settle this point by experiments on the inferior animals. With this view, he made a wound in the right side of the chest of a dog, and placing the thermometer in contact with the diaphragm, ascertained that the temperature was 101°. A large dossil of lint was then thrust into the opening, when the edges were drawn together with adhesive strips. On the following day, when the parts were in a state of inflammation, the foreign substance was removed, and the instrument being again introduced, no difference of heat was found to exist. Similar experiments were made on the rectum and vagina of an ass, with like results. Hence Hunter concluded that there was no real increase of temperature. From more recent researches, however, it is obvious that this inference of the great English surgeon is at variance with facts. Thus, in erysipelas, furuncle, and anthrax, the thermometer has been observed, in numerous instances, to rise as high even as 107°, being an increase over the average heat of the blood of eleven degrees. Results of a similar nature have been noticed in tetanus, acute rheumatism, and other maladies. — Ed.]

During the paroxysm of inflammatory fever all the secretions and excretions are diminished or suppressed; and hence the hot dry state of the skin, the thirst with foul and dry tongue, the scanty and high coloured urine, and the constipation of the bowels. This last symptom, however, though it may arise partially from the diminished secretion of mucus, yet is often dependent on disturbance of the functions of the brain and nerves. The pulsations of the arteries become rapid and strong, the sanguiferous system being unable to relieve itself by effusion, in consequence of the obstruction of the exhalants.

If the extreme vessels are in any way obstructed, and the general circulation in consequence much accelerated, the internal viscera become oppressed, and are interrupted in their functions; and relief is experienced only when relaxation occurs in the vessels upon the surface of the body. Thus, in any violent and continued exertion, there is a sense of oppression in the chest, and the functions of the encephalon are somewhat disordered, but as soon as perspiration breaks out the relief is instantaneous, and the animal can, without difficulty, persevere in its exertions.

In inflammatory fever, the breathing is often difficult, and the appetite declines; the patient is restless and watchful, and when he does sleep, he is not thereby refreshed. In the more violent cases, the sensorial functions are much disturbed; even delirium supervenes, with violent muscular exertion and convulsions, and may be followed by coma, should the local affection not subside. The delirium attendant on violent diseases and accidents may often be considered a beneficent effect of nature's operations; for the patient, frequently losing all consciousness of his situation, seems to be under the influence of the most pleasing hallucinations, and is freed from the more lamentable state of severe mental as well as bodily affliction.

Writers on Inflammation have expatiated at great length on *Sympathies;* and these have been divided into, 1st, The Partial — the Remote, the Continuous, and the Contiguous; — Remote, when parts sympathise, though situated at a considerable distance from each other; — Contiguous, when the sympathetic action seems to be produced, in separate parts, merely from juxtaposition; — Continuous, when the action extends in parts which are of similar texture, and conjoined with that which is primarily affected. — 2d, Universal, where the whole system suffers along with parts of it. For instance, the whole system is often disturbed by a deranged state of the alimentary canal, and, conversely, the bowels, or the skin, the brain, the osseous or any other of the textures, may suffer from a general disorder.

The system sympathises much more with some parts than with others; and we accordingly find that disorder in one part will give rise to alarming constitutional excitement, whilst in another, a much greater derangement in function and structure will apparently be almost entirely disregarded by the constitution.

Irritation is an effect of sympathy, and differs from inflammation, inasmuch as the functions of the nervous system, and not those of the sanguiferous, are disturbed; — the latter frequently supervenes on the former. Irritation is local, or constitutional. As examples of the strictly local species, may be mentioned that peculiar and dreadfully annoying sensation produced in the alveoli by the presence of a diseased tooth, or the irritation caused by ascarides in the rectum, or by stone in the bladder.

But, from this action being dependent on the nervous agency, irritation is frequently produced in a part remote from the source of the action. Thus, if an irritating cause of any kind be applied to the origin of a nerve, the effects of the irritation may be evinced in a part supplied by its extreme branches; while, if the cause is applied to the termination of a nerve, a similar action is produced at its commencement, and in parts supplied by nerves from the same origin. Thus, disease of the hip-joint causes pain in the knee, whilst dentition in children not unfrequently produces fatal effusion at the base of the brain; and again, irritation at the neck of the bladder frequently gives rise to pain in the feet.

Local impressions, injuries, or irritations, though apparently of little importance, frequently produce irritation which affects the whole system, and is therefore termed *constitutional.* Syncope sometimes follows the passing of a bougie along the urethra. We meet with too many instances of constitutional irritation following severe injuries or operations, especially if attended with much hemorrhage. In general, there is considerable prostration of strength; the patient is anxious and restless; his sleep is disturbed; the pulse is weak and fluttering, occasionally intermittent; the tongue is white and loaded; the appetite is gone; the stomach rejects the little food which the patient is able to take; he is startled and annoyed by the slightest external impression. At this period of the disorder, rigors generally occur, and are followed by a sense of heat, and by perspiration; then the above symptoms gradually decrease, and the patient recovers; but in certain instances his breathing becomes quick and somewhat oppressed, attended with a peculiar spasmodic elevation of the nostrils; all the secretions are diminished, the intellectual functions become impaired, and there are occasional convulsive twitchings; coma supervenes, preceded by a low muttering delirium, and followed by death.

This action, as well as every other, is much modified by the importance of the part which is the source of the action, and by the constitution of the patient. It is more severe in children than in adults. The affection will be more fully detailed, when treating of local injuries, and the management of patients after severe operations.

The *Causes* of Inflammation come next to be considered; and first, of the proximate cause or theory. The different states of the Vessels, in their healthy and in their incited condition, have given rise to much discussion. In the first place, considerable difference of opinion exists as to the relative share which the heart, the larger arteries, and the capillaries, have in propelling the circulating fluid in a state of health. Some physiologists are inclined to attribute the principal power to the heart, the blood being propelled and returned, according to them, almost entirely by the vis a tergo; while they suppose that the arteries possess merely a degree of elasticity or tonicity. Considering the arteries as elastic tubes, performing an indispensable part in the propulsion of the blood, we will now briefly consider their state in inflammation.

Passing over the different theories of error loci, spasm, &c., which have at various times been entertained, let us first examine the condition of the capillary vessels, for these are primarily and principally concerned. In inflammation, the balance of the circulation is destroyed, but a diversity of opinion has existed as to the precise nature of the change which occurs. It has been supposed, and perhaps correctly, that the circulation is, in the first instance, much accelerated in the capillary vessels of an inflamed part; but it has been satisfactorily proved by experiment, that, after inflammation is fairly established, the blood circulates more slowly than in the healthy state of the vessels. There appears, in fact, to be, as insisted upon by some writers on the subject, a state of excitement, then of collapse, followed, if the life of the part is not destroyed, by reaction. When a part is stimulated, the circulation is accelerated, and a greater quantity of blood is transmitted by its vessels: if the excitement is speedily removed, they recover themselves, though perhaps a little dilated, and no inflammation ensues. If, for instance, a foreign body of any kind gets entangled betwixt the upper eyelid and the bulb of the eye, and it is permitted to remain a few moments only, redness of the whole surface of the conjunctiva takes place, but it is transitory, and disappears entirely some short time after the extraction of the foreign body. If, however, it is permitted to continue longer in contact with this sensible surface, the membrane reddens more and more, and becomes thickened. Violent pain, with discharge of tears, and alteration of the secretion from the mucous surface, take place, ophthalmia is, in fact, established. If the exciting cause is applied for a sufficient length of time, the extreme vessels lose their contractility, they are weakened, become dilated, and the contained blood circulates slowly. When inflammation is fairly established in a part, the capillaries become considerably dilated, and the blood is often completely stagnated in the inflammatory point. In the circumference of this focus, it is accelerated as formerly noticed: the blood is probably stagnated for two or three days in the capillaries and in the contiguous cellular tissue, when the action is at all violent. It, however, begins to move again; it loses its colouring matter, while stagnated; the fibrin is assimilated to the neighbouring parts, or rather effused, so as to cause the thickening, and the blood globules have possibly undergone a change, and been converted into those of pus. If the disease be of a limited extent, and without breach of surface, they are carried into the circulation very gradually, and in such small numbers as not to produce injury to the health; otherwise the contamination of the blood by a large quantity of pus causes inflammatory fever. It is probable that the permanent dilatation occurs in consequence of the larger vessels in the immediate vicinity being incited, and propelling more blood into the minute capillaries than they can readily return into the corresponding veins; and in consequence of so great a degree of distension being produced, the vessels are incapable of again speedily contracting; the blood, also, from being stagnant, becomes of a darker colour. The larger trunks propelling blood into the distended and comparatively inert capillaries, which are incapable of transmitting into the veins the same quantity of fluid which they receive, will cause the throbbing or pulsating sensation. The blood circulating in the parts around is sometimes apparently changed in quality; it is redder, flocculi appear floating in it, and the globules disappear. These last may have been broken down, or partial decomposition may have taken place from a loss of vital power in the vessels themselves.

The blood globules are, perhaps, merely compressed; for whenever motion is produced in the fluid, they speedily reappear. Fresh globules also find their way into the affected capillaries from neighbouring vessels. The alteration in the component parts of the blood has been supposed to depend upon the previous state of the inflamed vessels in which it is contained: it is said soon to reassume its natural appearance, when brought into a healthy vessel, and reference is made to experiments on the web of the frog's foot. When once altered, it is, however, questionable if the blood ever reassumes its natural appearance; of course the blood which takes the place of that which was stagnated in the capillaries will be natural. If there have been extensive inflammation, and therefore much altered blood, one of two things will happen, viz., inflammatory fever and its consequences, or the discharge of the offending matter (the altered blood) as pus. We may also conclude that the blood of an inflamed part undergoes chemical changes; for when the part becomes gangrenous, the blood then loses its red colour, and assumes a yellowish-brown hue, from the absorption of its colouring matter, which necessarily implies an alteration in its chemical constitution. It seems not unlikely, that the change which is early observed in the appearance of the blood of an inflamed part is the commencement of a chemical process, which, if the vessels do not regain their contractile power, terminates in the total destruction of the ordinariy properties of that fluid. It is probable that the more modern speculators in medical science have paid too little attention to the state of the fluids, and to the fact that, when diseased action occurs in a part, its secretions and supplying fluid are very considerably changed.

But the blood in inflammation also undergoes a change, observable after its removal from the circulation, and especially when the system sympathises with the part affected. The blood, it is generally believed and stated, does not coagulate so quickly as in the natural state, or else, it is said, the red globules, being increased in specific gravity, fall rapidly to the lower part of the containing vessel, so that a yellowish crust appears on the surface of the crassamentum or clot; and this appearance is termed the inflammatory or buffy coat. The blood extracted from the veins of a patient labouring under inflammatory fever often appears to coagulate very quickly; but it contains an unusual proportion of fibrin. In certain states of inflammation, this crust is also much contracted, so that its marginal circumference is at a considerable distance from the sides of the containing vessel; its margins also are elevated and inverted; its upper surface is smooth, whilst the under adheres firmly to the coagulum; and in this state the blood is said to be cupped, as well as buffed. The appearance of the buffy coat is not peculiar to the inflammatory state, but is apparently dependent on hurried circulation, however occasioned. It frequently presents itself in blood removed from the circulation during pregnancy, and in several other conditions of the system, apparently altogether unconnected with inflammatory excitement. In these circumstances, however, the contracted or cupped appearance of the coagulum is hardly ever observed. An ignorance of the above fact leads to dangerous practice, inasmuch as certain practitioners will bleed, and continue to bleed, for very equivocal inflammatory symptoms, conceiving themselves fully warranted in so doing by the presence of the buffy coat. This coat is often not so apparent in the blood first drawn as in that afterwards abstracted.

In inflammation, as was formerly remarked, a greater quantity of blood not only flows into the capillary vessels, but it also escapes from them, or is extravasated. This may occur with or without rupture of the vessels, and to a greater or less extent, according to the violence of the action, and the texture of the part.

When local inflammatory action exists to a considerable degree, the general circulation is more or less disturbed. The heart, and the larger vessels supplying the capillaries, which are more immediately concerned in the local action, subsequently sympathise with the part affected, and, acting with greater vigour than usual, propel the blood into the extreme branches; so that the inflammatory excitement may be said to be gradually communicated by the continuous sympathy, till the whole sanguiferous system becomes subject to its influence. The degree of this general excitement depends greatly on the texture and function of the part primarily affected.

The term *Passive* Inflammation has been applied to that state in which the larger vessels are not excited, or have ceased to sympathise with the capillary branches. The term *Chronic* Inflammation is properly limited to the consequence of the acute inflammatory action, the part remaining turgid and swollen, the vessels over-distended with dark blood, but with little or no pain, and without heat or throbbing. *Congestion* is also employed to denote fulness of the vessels, large as well as small, when no sign of excited circulation, or of decided inflammatory action, has occurred. It is most frequently used, however, when describing the condition of an internal organ. An over-distention of a particular set of vessels may certainly exist (as a consequence of inflammation, or altogether unconnected with it), unattended with inflammatory action. These two states ought to be carefully distinguished from a similar condition of the vessels, attended with inflammation; for practice, which would be beneficial in the one case, is highly prejudicial in the other, and lamentable examples of the non-attention to this distinction are every day observed.

It may here be mentioned, that some have denied the existence of vitality in the blood; and to some minds it may, perhaps, be difficult to conceive how a fluid should be possessed of this principle. But no one can either doubt or deny that the blood, in its distribution, in its manner of receiving increase, in the secretions furnished by it, and in its various morbid changes, is governed by certain laws and principles which cannot be explained by those of chemistry or mechanics, but must belong to some other power. It is allowed, and has been promulgated by all authors, that the blood is one of the most active agents in the animal economy — in repairing waste, in affording peculiar fluids necessary in that economy, in supplying organs with materials for carrying on their functions, &c.; and yet all this, according to some, is accomplished by a dead animal fluid; no one can plausibly object to the laws by which the blood is governed being referred to the power of life, and to their being called Vital Principles.

Certain circumstances give rise to inflammation, and have been called its *Exciting* or *Immediate Causes.* Among the external applications producing inflammation, stimulants bear a conspicuous part; the effects of which, in causing this action, are well shown by many experiments that have been performed on the lower animals: by the application of ammonia, spirits of wine, or common salt, for example, to the diaphanous web of a frog's foot. As stimulants usually causing inflammatory action, by their being applied to the surface of the body, may be enumerated acids, alkalies, certain salts, animal substances, such as cantharides, the juices of many plants, many poisons, an excessive degree of heat, &c. Any solid substance, though by no means acrimonious in its quality, may act as an exciting cause, as by pressure or friction.

Wounds also, especially when of considerable size, and occurring whilst the constitution is in an unhealthy condition, give rise to local, and occasionally general, inflammatory action.

This action is besides frequently produced by injury from an obtuse body causing a bruise or fracture; by the lodgement of extraneous substances, or of decayed portions of the system, — such as portions of bones, tendons, &c.; or by irritating matter generated in the system itself, — by concretions, tumours, vitiated secretions, &c.

One of the most frequent causes of inflammation is cold; the action of which, however, cannot always be readily explained. In some instances, it appears to act directly on a part, as in inflammation of the mucous membrane lining the organs of respiration: in others, its action is indirect, probably by disturbing the equality of the circulation, the inflammation occurs in a part distant from the surface the temperature of which had been diminished. In the great majority of instances in which inflammation has occurred, in consequence of very intense cold, it is produced by the sudden application of heat whilst the temperature of the part is greatly below the natural standard, as will afterwards be more particularly illustrated. But the inflammatory action may be produced, even though no heat be afterwards applied directly to the part, by its vessels being too rapidly brought into a degree of action similar to that of the surrounding parts which are in their natural condition. Sudden and general diminution of temperature seems to act as an exciting cause, by producing an instantaneous suppression of the transpiration. Another exciting cause of the inflammation, is the retention of the secreted fluids, causing unnatural distension of canals or cavities, and is exemplified by cystitis occurring in consequence of retention of urine. Certain states of the constitution are justly supposed to excite inflammation, in particular textures. Other exciting causes of inflammation might be enumerated, but these will be more naturally explained, and more fully considered, whilst treating of inflammation of the various tissues and organs. Their effects are various and diversified, according to the intensity of the cause, the structure, function, and sympathies of the part affected, and the state of the system. And it is also to be remembered, that not unfrequently inflammatory action appears, whilst we can assign no cause for its production.

Inflammation is said to terminate in *Resolution*, *Suppuration*, and *Mortification*. The application of the word termination, however, is injudicious; for in general the inflammatory action, though much abated, is not extinguished by the occurrence of suppuration or mortification, but often continues in the surrounding parts with unabated intensity; and not unfrequently several of the terminations occur combined with each other.

Adhesion has also been mentioned as a termination of inflammation, but perhaps improperly; for, although in certain parts of the body, as in the serous cavities, adhesion is produced in consequence of inflammatory action, and during its progress, still the process of adhesion is altogether independent of this action in other textures, such as the cellular. In the uniting of a flesh wound, a certain degree of incited action of the bloodvessels is necessary for the accomplishment of the adhesive process; but should that incited action reach the inflammatory pitch, the union by the first intention is interrupted, and the wound must heal by granulation with suppuration. The process of adhesion will be more properly attended to when treating of wounds.

The various terminations of inflammation are salutary or destructive, according to circumstances; but resolution is, in general, the one most to be desired; complete resolution, however, perhaps seldom occurs; after the inflammatory action has attained a certain point, this cannot be expected to happen.

Resolution takes place in consequence of the reëstablishment of the circulation in the capillaries, in which the blood had stagnated; hence the diminution of the increased action in the larger vessels — the effused fibrin, at the same time, if there was much swelling, is partly absorbed. The circulation in the part becomes again natural, and the circulating fluid also resuming its healthy properties, the redness and sensation of throbbing cease. In consequence of the bloodvessels regaining their contractility, the nervous system is no longer preternaturally stimulated, and thus the increased sensibility is done away with. In short, when inflammation terminates in resolution, the part is left in the same state in which it was previous to the supervention of the attack. It is not an instantaneous process, but gradual in its completion.

Again, it not unfrequently happens, when inflammation has occurred in the surface, and continued for a short period, that it spontaneously disappears, and does not again return; the action is said to terminate in *Delitescence*, and of course this is always a favourable occurrence. But if the inflammation, after having suddenly disappeared, attacks another part at a distance from that first affected, the change is termed *Metastasis*. If the inflammation leaves an internal viscus, and appears on the surface of the body, the circumstance is favourable; but if it leaves the latter to attack the former, the result is highly dangerous.

Treatment.— In the treatment of inflammation, with a view of procuring resolution, our attention must be first directed to the exciting cause: it is, if possible, to be discovered, and removed. Thus, foreign bodies are to be extracted — fractures reduced — strictures divided — unnatural accumulations of fluid withdrawn, &c. In many cases, if the exciting cause is removed, nothing more is required; the inflammation speedily subsides. If the cause cannot be removed, or if, after its removal, the inflammation proceeds unabated, the arterial action must be reduced by general and local abstraction of blood. By general depletion, the action of the whole sanguiferous system is diminished, as well as of those vessels more immediately engaged in the morbid action; but the affected capillaries are still dilated, and less capable than the larger trunks of effective contraction to propel their contents; and are therefore only sufficiently depleted by the local abstraction of blood, by leeches,* cupping, punctures, or inci-

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* [Leeches may be applied to almost any region of the body, excepting such as are abundantly supplied with loose cellular substance, as the eyelids and scrotum; or traversed by large subcutaneous veins. Parts in a state of high inflammation must also be avoided, otherwise gangrene may be induced, an effect which I have several times witnessed in hospital practice: in a case of this kind they should be placed in the immediate vicinity of the disease.

Previously to applying them, the skin should be thoroughly cleansed with a wet sponge, and moistened with a few drops of milk, blood, or sweetened water. Dipping the leeches in table beer is very effective in rendering them lively and active. Having been withdrawn from the water in which they are kept for a quarter of an hour before, they should be held to the part by means of a glass tube, a roll of pasteboard, or a piece of linen. When there is plenty of space, as on the abdomen, chest, or back, and it is designed to use sions.* Blood may be drawn either from arteries or from veins. In Arteriotomy, the blood is discharged more rapidly, and its flow is of longer continuance, than from a vein, so that the system may thereby be almost completely deprived of its circulating fluid ; and perhaps a more speedy impression may be made on the inflammatory action. One objection to venesection is, that after frequent and copious venous hemorrhage, the internal vessels become gorged with blood, and a disposition to apoplexy is induced.

But bleeding is not to be had recourse to without due consideration of the age, strength, constitution, and idiosyncrasy of the patient ; if employed, it must be modified according to these ; and it has already been mentioned, that depletion is not always to be persevered in on account of the presence of the buffy coat.†

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a great number, they may be confined by an inverted tumbler or a wire-gauze cage. They should not, however, be crowded too closely together, as erysipelatous inflammation is apt to arise when this is done ; and they ought not to be touched until they drop off of their own accord. If they remain on too long, their separation may be facilitated by sprinkling them with a little salt or vinegar : pulling them away is painful and liable to occasion irritable sores. The subsequent flow of blood, which is generally considerable, especially in children, is to be promoted by cloths wrung out of warm water, and reapplied every ten or fifteen minutes for several successive hours.

If the bleeding be profuse or continue longer than is desirable, it may be arrested by some styptic powder or lotion, either alone or assisted by a compress and roller. In obstinate cases, it may be necessary to apply the nitrate of silver or chloride of zinc ; or, what is better, because more effective, to use the twisted suture made with a very fine needle and ligature passed through the sides of the little wound. — Ed.]

* [Scarification is a very efficient mode of abstracting blood, and one which, in my own hands, has often been attended with the happiest results. It is performed by drawing a sharp thumb-lancet rapidly and lightly over the affected surface, in as many places as may be deemed necessary, and afterwards encouraging the bleeding either by means of a wet sponge or by immersing the part in warm water. Scarification is mainly used in chronic ophthalmia, attended with great vascular turgescence of the lower lid, in scrofulous swellings of the joints, in chronic enlargement of the testicle and epididymis, in irritable ulcers of the leg, in tonsilitis, and in erysipelas. — Ed.]

† [All practitioners are aware how much the formation of the buffy coat is influenced by extraneous circumstances. Of these the most important are the shape and capacity of the receiving vessel, the degree of motion to which the blood is subjected, and the size of the orifice in the vein. Dr. Belhomme, of Paris, who has minutely investigated this matter in a series of one hundred and fifty experiments, has come to the conclusion that a narrow basin, a large orifice, and a full, rapid stream, in the form of an arch, are the external condi-

Bleeding is materially assisted in reducing the activity of the circulation, by the employment of saline purgatives, along with nauseating doses of antimony. Diaphoretics are of essential service in promoting the action of the exhalants, and thereby relieving the affected capillaries. The exhibition of opium is frequently advantageous, more especially after depletion, in allaying the painful sensations when severe, and averting reaction, and also in procuring refreshing sleep, when the patient is anxious and restless. Digitalis has been administered, with the view of reducing the arterial action; but it has been fully established, that this medicine acts at first as a direct stimulant, and that it is only after its use has been continued for some time that its effects become sedative.

The local applications to an inflamed part are sometimes made hot, sometimes cold. The latter will perhaps be at first the more grateful to the sensations of the patient. They are, however, with greater propriety employed before inflammatory action is fairly established, and they act by constringing the superficial vessels with which those more deeply seated sympathise to a certain extent; but warm fomentations are more pleasant and useful when inflammation has really taken place; they relieve the pain more effectually, and at the same time promote the cutaneous transpiration; they relax the surface moreover, effusion is thus encouraged, the deeper vessels are so far relieved of their load, and the pressure upon, and stimulation of, the nerves are thus diminished. After the violence of the symptoms has abated somewhat, the vessels still, however, being loaded with blood, the inflammation in fact having become chronic, stimulants may with propriety be applied directly to the affected parts; these are employed, perhaps, with greatest advantage immediately after the bloodvessels are unloaded by leeching, scarification, or punctures; this practice is borne out by the result of experiment and observation. It is seen, that after the vessels have become dilated, and the blood has stagnated in them through the infliction of injury, or the application of some stimulating substance, that the employment of another and different stimulus immediately causes the contraction of the capillaries, and the renewal of active circulation.

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tions most favourable for producing the buffy coat. The results of these researches have since been verified by those of Gendrin and other observers, and they are well worthy of recollection, as they are calculated to exert an important bearing on the practice of our profession. See my *Elements of Pathological Anatomy*, Vol. I., p. 207. A *cupped* state of the blood most commonly occurs in association with inflammation of the serous membranes and parenchymatous organs, and may generally be regarded as evincive of a high degree of vascular excitement. Still, not too much stress should be placed upon this appearance, as it is sometimes present in states of the system the very reverse from that just mentioned, in persons, for example, who have been repeatedly bled or whose strength has been otherwise very much reduced. — Ed.]

During an inflammatory attack, the patient should be allowed very little food, and what he does receive must contain little nutriment in proportion to its bulk. But in many cases it is unnecessary to enjoin such abstinence, as the patient has no appetite, and refuses food.

In inflammation of deeply-seated parts, such as the apparatus of some articulations, it is a frequent mode of assisting the completion of resolution to excite inflammatory action in an external, and consequently less vital and important part. This is accomplished by the application of stimuli, caustics, cautery, setons, &c.

It appears that the stimulating substance produces an incited action of the bloodvessels, or a revulsion, according to the older authors, in the part to which it is applied; and that, consequently, the neighbouring arterial trunks, in order to sustain that incited action, supply the part with a larger proportion of their contents than it usually receives; and the necessary consequence of the stimulated part receiving an additional supply of blood is, that the part originally inflamed receives less. The effect, indeed, seems analogous to that of topical bleeding, with this difference — that it is more permanent. Besides, it determines suppuration on the surface, and so renders it less necessary for the vessels to produce pus in a worse situation — the deeper seated parts.

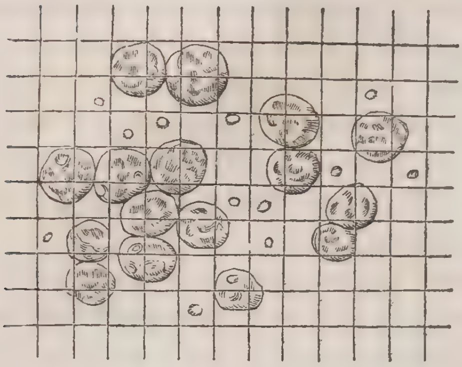
But it must be borne in mind, that this method is not to be resorted to in the commencement, or during the active state, of the inflammatory action, but only when that action has begun to decline, otherwise the disease may be much aggravated, instead of being relieved.

If, notwithstanding all the means employed to procure resolution, the inflammatory action continues unabated, the result next to be desired and accelerated is Suppuration; and with this view, it becomes necessary to change the treatment, both local and general.

Above all, disuse and a proper position of the affected part must not be neglected. Unless absolute repose is strictly enjoined and attended to, and the return of blood from the inflamed tissues is favoured, very great difficulty will, in the majority of cases, be experienced in removing any of the signs or symptoms of inflammatory action, even by the most energetic means, general or local. This will be more fully insisted upon in the progress of the work.

OF SUPPURATION AS A CONSEQUENCE OF INFLAMMATORY ACTION.

It has already been stated, that the blood is stagnated in the capillaries occupying the centre of the inflamed part, as well as extravasated in the contiguous cellular tissue. Pus has long been considered as a secretion; but, from the time of Mr. Hunter downwards, a great similarity between the globules of pus and those of blood has been recognised: the former, however, are spherical, larger, and rougher on the surface, and are not so regular in size as those of blood; their diameter is between $\frac{1}{2000}$ and $\frac{1}{3000}$ of an inch, although some of the globules may be occasionally seen a little larger or smaller than these measurements. Smaller particles are also detected, the molecules of the pus globules, each of which contains two or three. These molecules are insoluble in acids, soluble in caustic alkalis, and can be freed from the fibrous capsule in which they are contained, and of which the pus globule is composed, when treated with acetic acid. The appearance of the pus globules and molecules is here shown upon a scale, the squares of which are $\frac{1}{4000}$ of an inch. These small particles were pointed out to me by my friend, Mr. Gulliver, nearly two years ago, as constituting an important element in suppuration. It results from his observations that the entire pus globule is composed in its central part of these minute molecules, the diameter of which is from $\frac{1}{10666}$ to $\frac{1}{8000}$ of an inch, cemented together, as it were, by a superficial deposit of matter possessing all the properties of coagulated lymph. And these minute nuclei constitute a proximate animal principle, possessing such well marked characters as to justify us in regarding them as peculiar in their nature, and essential to the composition of the pus globule. Thus they resist putrefaction with remarkable pertinacity, are very dense, and spherical in form, and are insoluble in some acids which act with facility on albumen, fibrin, or the blood-corpuscle. They are easily seen by treating a little recent pus with sulphurous acid, which so acts on the pus-globule as to render the nuclei distinctly visible through its fibrinous capsule; by sulphuric acid the external part of the pus-globule is quickly dissolved, and the nuclei, somewhat shrunk, are seen in considerable numbers floating separately about the field of vision. The instrument used by Mr. Gulliver in these observations was a compound achromatic microscope, with a deep object glass, having one-eighth of an inch focal length.



In many constitutions, the slightest incited action of the vessels is followed by the formation of pus, and the appearance of a depôt of purulent matter is often the first indication that such action has existed; but in the majority of instances, the deposition of pus is preceded by the usual characters of well-marked inflammatory action. Suppuration occasionally occurs without previous solution of continuity; for pus is frequently contained in the serous and mucous cavities, when no breach of continuity can be discovered, at least we find a fluid not distinguishable from purulent matter; it may be a vitiated secretion, but still it presents the usual characters of pus. But it occurs, generally, when there has been a previous læsion of structure, and in this case its progress is most distinctly marked. In exposed cellular texture, for example, particles of blood are effused; the serum is afterwards absorbed, and the lymph remains; this latter gives transmission to minute vessels which deposit the purulent fluid, whilst others secrete particles of organised matter to form granulations, in order to repair the loss of substance. This process is often unattended with any great degree of constitutional disturbance, because the fibrin effused sets a bound to the pus, and is the provision against its being mixed in large quantities with the blood. In healthy suppuration, the separation of fibrin and pus from the blood in this way seems to have direct relation to each other; and in unhealthy inflammation, when this does not take place, the consequences are mixture of pus with the blood as formerly noticed. In the latter form of suppuration the fibrin, instead of being assimilated to the contiguous mass, is mixed with the pus; hence the proneness to putrefaction of such discharge, and its disposition to coagulate spontaneously when evacuated. This kind of suppuration, being matured generally without thickening of parts, has been sometimes pointed out as suppuration independently of previous inflammatory action.

After purulent matter has begun to accumulate under the surface, the pressure thereby occasioned produces condensation of the neighbouring cellular tissue, which, along with the previously effused lymph, forms the parietes of the abscess; and in proportion as the matter accumulates, the cavity enlarges by the successive processes of ulceration of portions of its parietes, by continued effusion of lymph, and by farther condensation of the surrounding parts. Thinning of the parietes takes place by ulcerative absorption, particularly towards the surface — or, if that be difficult, towards a mucous outlet — as is exemplified by the bursting into the bowels or bronchiæ of abscess of the liver.

But in some instances, when no lymph is previously effused, and no cyst is formed, the matter is not confined, but pervades the cellular substance extensively, and is generally followed by more or less sloughing of that tissue, and by great constitutional disturbance. This most frequently occurs in patients of a debilitated habit, in whom the incited action has been so slight as not to cause the effusion of lymph, by which nature usually sets bounds to the suppurating process.

M. Gendrin advanced the opinion that pus was nothing but transformed blood; but his experiments on frogs are at least doubtful, since Mr. Gulliver, on repeating them, could not by any means induce the process of suppuration in these animals. It has been rendered probable by this gentleman's observations that suppuration is a sort of proximate analysis of the blood, the fibrin being added to the contiguous parts, as in causing them to swell, forming the cysts of abscesses; the blood globules altered into pus being discharged as useless and excrementitious matter.

Pure pus is heavier than water, of a yellowish-white colour, somewhat of the consistence of cream. It is very little inclined to putrefaction, less so, perhaps, than any animal fluid not oily. It is composed of globules, and a clear transparent fluid, coagulable, it has been said, by the muriate of ammonia. When a solution of this salt produces any change, it is by rendering the pus more ropy; not coagulation, but a sort of gelatinisation follows. It is said also to be sweet and "mawkish to the taste."

In unhealthy pus, such as already noticed, or in vitiated mucopuriform secretion, the colour and consistence are different, and flakes, resembling portions of lymph, are seen floating in it: they consist of fibrin thrown off with the pus, instead of being used for reparation and bounding the extent of the abscess; and by this latter circumstance such fluid is distinguished from the pure or laudable pus. In purulent matter also, especially that of an unhealthy character, the existence of a quantity of sulphureted hydrogen is indicated by the blackening of silver probes, and of various substances applied to the sore. It is necessary to bear in mind, that a matter resembling pus in many particulars, but in reality differing essentially from it, has generally been regarded as true purulent fluid; for it results, from some observations of Mr. Gulliver, that the pulpy matter, so frequently found in the substance of fibrinous clots of the heart and veins, is simply fibrin which has coagulated and passed into the state of softening, which he regards as a very frequent elementary disease. The subject is one of great interest, because it is connected with the theory of suppuration, and tends to modify materially our views on the pathology of the veins.

The symptoms attendant on suppuration vary much according to the nature of the parts involved. In general, it is accompanied with the subsidence of acute pain and fever; but, in unyielding textures, the increase of swelling, by the formation of purulent matter, is often attended with an aggravation of the symptoms, and with an increase of danger to the structures affected. The pain which accompanies suppuration is dull, and attended with a sensation of fulness and throbbing, and an increase of the tumour; ultimately the parietes of the abscess become absorbed, and the collection, being more superficial, the most careless observer must be convinced of its existence, by the less equivocal signs of fluctuation and pointing. In general, especially when the abscess is deeply seated, a greater or less degree of œdema surrounds it, producing a soft pitting tumour; but not unfrequently, when the degree of excitement is more intense, lymph, instead of serum, is effused, rendering the part more hard and resisting: in such cases it may be difficult to discover the existence of purulent matter, and the tactus eruditus, as it is called, will be found of material service; for, though pus is neither acrid nor corroding, still, if allowed to remain for any long period, much mischief may be caused — the bones may become diseased — muscles and tendons may slough — and the matter may discharge itself, by means of ulceration, into certain cavities and canals, and produce very serious consequences. Of the bad effects produced by the pressure and irritation of extensive and undisturbed collections of purulent matter, every practitioner must have seen numerous examples. Still, through prejudice, erroneously conceived opinions, or servile imitation, the greatest dread seems, with many, to exist of the practice of giving a free exit to the contents of such depôts.

The symptoms and sensible signs of suppuration are usually preceded by shivering, recurring at intervals, and commonly terminating in profuse perspiration. But this is by no means an unequivocal sign of the occurrence of suppuration; and this process very often takes place without any feeling of rigor.

The older authors supposed that pus was derived from the solids — or that it was formed by the melting of dead animal matter — or that it was the result of putrefaction; in accordance with which latter opinion, the term pus was given to the fluid; but such opinions have long since been justly exploded. Pus is generally supposed to be separated from the blood by the secreting power of the bloodvessels of an exposed and inflamed part, in consequence of their having assumed a new mode of action. The secretion from exposed surfaces is not at first purulent, but is transparent, serous in fact, and is somewhat of a gelatinous appearance; and it is only, it is said, after exposure to the atmosphere for some time, and when drying, that it presents the appearance of globules. Pus is often formed where the secreting surface has not been exposed to the air; on opening an abscess, the parietes of which had been previously entire and not much attenuated, purulent matter of the usual properties is discharged. It has been asserted that pus globules may be formed independently of any vital action; and that, if the serous fluid be removed immediately after its secretion by a granular surface, and kept in a temperature similar to that of the inflamed part, and be at the same time freely exposed to the air, globules will appear in as short a period as when the secretion is allowed to remain in contact with the sore. Some have also supposed that the mere admission of air into the cellular substance causes suppuration; but this is far from being correct. In chronic purulent depôts, however, the admission of air, by favouring putrefaction probably, often produces most serious results; other causes are generally in operation at the same time, as will be afterwards more fully explained.

Pus was formerly regarded as irritating and corroding, and was therefore carefully removed from every granulating sore; but purulent matter, though it may prove a source of irritation to the neighbouring parts, does not disturb the surface which secretes it, but, on the contrary, protects the tender granulations, and acts as a temporary cuticle. A crust is formed by the evaporation of the thinner part of the fluid; and we frequently see small sores healing rapidly when thus protected. In some instances, we adopt the hint given to us by nature, and produce a scab by the application of powders, lunar caustic, &c.

The discharge does not always consist of laudable purulent matter. Pus formed in the diseased part itself has particular characters, according to the tissue involved; thin and greyish in bones, opaque and caseiform in cellular tissue, flocculent in serous, and greenish and thready in mucous membranes; it is said to be reddish in the liver, and yellowish-grey in muscles. Its sensible properties are various, often very offensive when proceeding from a cavity containing decayed bones, and it degenerates in consequence of disturbance of the constitution, or of the part affected. It is also frequently suppressed, in consequence of overaction in the vessels of the part, or from debility, partial or general.

Suppression of a purulent discharge is to be regarded as an untoward symptom, fraught with considerable danger, being generally followed by the most violent constitutional disturbance. Certain cases would seem to warrant the belief that a species of metastasis occurs; that the matter is absorbed, and again deposited in some other part, perhaps of the utmost importance in the animal economy. The danger arising, when the pus is not separated from the blood, has already been adverted to. No wonder, if from any cause it does not escape by its accustomed channel, that an effort should be made to deposit it somewhere else, for the temporary relief of the system. The most vascular parts are commonly chosen, as the lungs, spleen, and liver. In the cavities of joints, also, matter is often found in great quantities. This is sometimes indicated by the occurrence of tenderness and swelling for only a short period previously; but, in other cases, its presence has never been suspected. In purulent collections, after wounds from accident or operation, on the suspension of the discharge, the patient becomes affected with severe constitutional irritation, and gradually sinks; the existence of purulent depôts in the viscera of the chest or abdomen, being perhaps not indicated by any, unless very equivocal, symptoms, and these appearing only a short time before dissolution. A late writer has endeavoured to connect this with inflammation of the veins; but such an opinion is not borne out by observation, although the two circumstances may occasionally coexist. In many cases the veins of a limb are found filled with pus, yet their coats present no marks of inflammatory action having existed in them. Their mouths are open in the wound, from failure of that healthy action by which they would have been closed by coagulated lymph, and the matter appears to be taken up by them as secreted.

From the discharge varying according to the state of the system, the latter can in general be accurately ascertained by examination of the sores which afflict the patient.

In collections of matter not far removed from the surface, the most superficial, and generally the most dependent, portion of the parietes appears inflamed; its inner surface is gradually absorbed; and, when it has thus become attenuated, a portion of the integument sloughs or ulcerates. A communication is established with the diseased parts, through the external surface, thus providing an aperture for the evacuation of the matter — of extraneous substances — or of parts of the body which have either mortified, or otherwise become useless to the system. In such collections, more especially if deeply seated, the matter generally seeks the surface, or extends in the course of the bloodvessels.

Cold abscesses, as they are called, often contain as much flaky fibrinous matter as true pus: hence one of the signs of inflammation, swelling, is absent; the fibrin being discharged instead of having been added to the neighbouring parts.

As formerly remarked, suppuration occurs much more readily in some constitutions than in others; and patients peculiarly liable to the formation of abscesses, without any great degree of previous excited action of the bloodvessels, are said to labour under *Struma* or *Scrofula*. These terms are by some used to denote a distinct or specific disease, while others consider them merely as a peculiar state of the constitution.

The strumous diathesis is said to be marked by hair and irides of a very light colour, and by the skin being of a peculiar white hue;

but, in some instances, the complexion is unusually dark and sallow. The upper lip generally presents a swollen appearance, as also the columna and alæ of the nose. The organization throughout is delicate, and the patient is frequently of a handsome, though infirm, structure.

Constitutions, in every respects strong and originally vigorous, may, from various causes, become weak, and present many of the symptoms usually termed scrofulous. I recollect a young patient, born of healthy parents, who had enjoyed excellent health, becoming covered with ulcers and chronic abscesses, in consequence of exposure to cold during menstruation.

To the continued irregular and imprudent exhibition of mercurial *alteratives*, as they are called, may be attributed the cachectic and scrofulous constitutions of many thousands of patients of all ages.

The strumous diathesis is said to depend upon a want of balance, or proportion, between the solids and circulating fluids. Want of action and power in the organs forming and circulating the blood, disordered digestion, and various other circumstances which it is unnecessary to detail, have also been considered as causes of this state of the constitution.

Many suppose that the diathesis, or a disposition to the diathesis, is always congenital; and this opinion is supported by the majority of cases. However, certain circumstances produce a scrofulous habit of body in patients who previously appeared to be vigorous and healthy, and untainted with any peculiar disposition to disease. Of these predisposing causes may be mentioned, a poor diet, an impure atmosphere, exposure to damp and cold, inattention to cleanliness, the latter circumstance acting sometimes by producing local irritation: in fact, whatever deranges the general health, seems, in many cases, to induce the strumous diathesis. Some constitutions are incapable of resisting any unusual incitement of the vascular system, or of repairing the consequences of the action, or of any injury, in whatever way inflicted. In such individuals, all the parts of the body are deficient in power — some, however, are more so than others, and, consequently, more readily give way; thus, the lymphatic system, the mucous membranes, the skin, the bones and their coverings, generally suffer in the first instance.

Glandular swellings of all kinds, and in all situations, often followed by suppuration, are apt to occur from irritation of various descriptions, but more so in constitutions originally weak, or which have become debilitated by disease or any other cause. The larger glandular tumours are formed by congregation and agglutination of the smaller ones, and by the deposition of adventitious matter in the connecting cellular substance; separation of the smaller tumours composing these, naturally, or under the use of deobstruents exhibited internally, or applied to the surface, is a highly favourable sign, and equally encouraging to the surgeon and the patient.

Dentition, the presence of carious teeth, of stumps of teeth; excoriations behind the ears, eruptions on the scalp, affections of the lining membranes of the eyelids, mouth, or nose, of the skin of the face, are daily found giving rise to glandular swellings in the neck; whilst irritations in the urethra, excoriation or slight disease about the anus, corns or sores about the feet or toes, produce similar affections of the glands in the groin. Such sources of irritation are, of course, to be looked for in the first instance, and will often materially influence the diagnosis, though too much is occasionally attributed to their influence. Such glandular tumours, however, sometimes occur spontaneously, or, at least, without any evident cause. They have been mistaken for other diseases, according to their situation—for aneurism, hernia, or venereal bubo; the latter mistake is often committed unintentionally by the ignorant, or designedly by the unprincipled.

Tumours formed by the enlargement of glands are frequently productive of dangerous consequences. If situated in the neck, they may render breathing and deglutition extremely difficult, and in the event of their suppurating, the purulent matter may be discharged into the trachea or gullet; fatal results have followed the giving way of an abscess into the former canal. The breathing is also seriously impeded by enlargement of the bronchial glands, by the pressure of which the lungs may be much condensed, and unfitted for their functions. The immediate effect of enlargement of the mesenteric glands, is interruption to the passage of the chyle, and a consequent decline of the powers of life. Such tumours in the abdomen have been mistaken for enlargement of the liver, spleen, ovarium, &c., and the most noxious treatment employed.

Inflammatory glandular enlargements terminate either in resolution, in delitescence, or in suppuration; sometimes in death of the part. When the tumour, after having attained a certain size, gradually disappears, it is said to be resolved; when, however, it is rapidly discussed, it terminates in delitescence; the difference between the terms being the same as when used to express the corresponding terminations of inflammatory swelling in general.

Suppuration is by far the most usual termination, and the matter is frequently evacuated through numerous small apertures, exposing the gland denuded and prominent in the middle of the chasm; in such cases, the gland proves the source of much irritation, and must be destroyed, otherwise the cure is extremely tedious.

Though inflamed and swelled lymphatic glands very generally disappear by suppuration, it is to be remarked that the conglomerate glands, though often violently inflamed, seldom, if ever, have pus formed in them; in mumps, for instance, the action often runs very high, yet abscess of the parotid is rare. The submaxillary salivary glands are often supposed and said to be inflamed and enlarged; the conglobate glands superficial to them are in such cases only affected.

Collections of pus in the lymphatic glands or cellular substance, in patients of a weak constitution, (whether naturally or in consequence of disease,) are attended with little or no pain, or inflammatory action; and although it is probable that inflammation does precede the formation of such purulent depôts, still it is generally so slight as not to attract the attention of the patient or his attendant. The sensation is dull and uneasy, rather than painful; and, even after the accumulation of a considerable quantity of purulent matter, redness of the surface and pointing do not occur till a late period. The contained matter is thin, flaky, and of a brownish colour. The collections often attain a very great size, and, if improperly treated, terminate in the formation of numerous and extensive sinuses.

The skin, particularly that of the face, becomes, in very many cases, affected either primarily or secondarily with scrofulous ulceration, which commonly extends to the neighbouring textures. The disease has sometimes been mistaken for cancer, and other affections of a malignant nature, and has received various names accordingly. The integuments in the neighbourhood of the ulcer are of a purple hue, and become undermined, from the extension of the disease in the subjacent cellular tissue. The discharge is thin and gleety— the sore is of an unhealthy and debilitated character, and makes but little attempt at reparation; its surface is covered by a viscid fluid, and sloughing occasionally occurs in consequence of the extreme debility of the parts. Numerous sinuses frequently extend in a superficial direction, and render the cure more tedious and complicated.

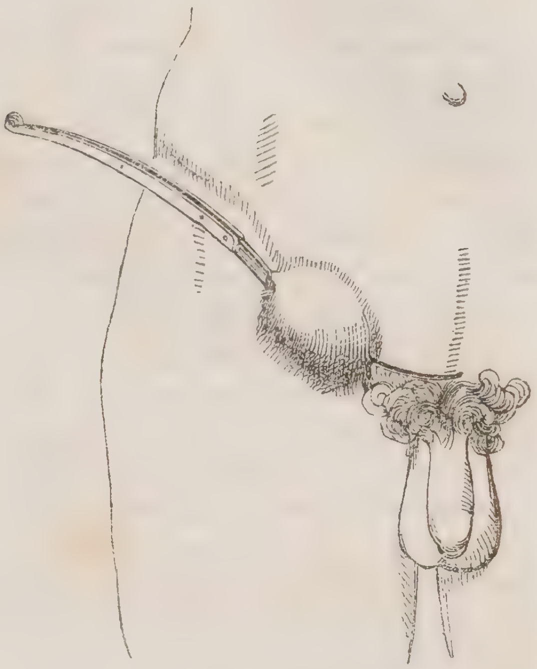
Those of a scrofulous constitution are most liable to be affected with caries, softening, and other diseases of the bones and their coverings; these, however, will afterwards be treated of, along with ulceration of cartilages, diseases of ligaments and synovial membranes, lumbar abscess, &c.; all of which affections, in the plurality of instances, are connected with the strumous diathesis.

In the treatment of abscesses, the principal indications are, to remove any degree of inflammatory action with which the surrounding parts may be affected — to keep the part moist, clean, and at rest — to remove all source of local irritation — to promote and accelerate the progress of the matter to the surface — and, lastly, to give it free vent; for though it sometimes happens that collections of purulent matter disappear, still the occurrence is so rare, that to treat abscess generally when in an advanced stage with the expectation of resolution would be highly injudicious. By blistering and pressure, however, tumours containing a small quantity of purulent fluid can occasionally be discussed. Warm fomentations afford great relief, especially at the commencement, when there still remains a considerable degree of surrounding inflammation. These may be either what are termed anodyne, or not; in general, fomentation with chamomile flowers or hops, contained in a woollen bag, and wrung out of warm water, will be found the most convenient and efficient, and is well entitled to the term anodyne, which is usually applied to others of a complicated, and not more efficacious, character. Poultices are of material service, particularly when the collection is advancing to maturation; and their composition is of little importance, provided they are moist, warm, and soft. Stale bread soaked with hot water, or an equal quantity of grated bread and linseed meal,) if not adulterated with mustard, as is sometimes the case,) mixed with sufficient quantity of boiling water, form excellent and soothing cataplasms. Their use, however, may be persevered in too long; for, after an abscess has given way, the suppuration may be kept up in consequence of continuing the poultice. The opening will enlarge, the skin become undermined, loose, and flabby, the abscess will extend, while the process of granulation may be in a great measure suspended. In many cases, the poulticing cannot be continued until an opening has formed naturally, and the cure is often much accelerated by the artificial evacuation of the matter. When the abscess is situated deeply, or beneath a fascia, a free and early opening must be made. For example, when suppuration has occurred in the cellular tissue beneath the fascia lata of the thigh, it at first naturally tends towards the surface, but its progress is impeded by the tendinous aponeurosis; a painful feeling of tension is thereby occasioned, and the matter extends where there is least resistance, making its way in all directions into the surrounding cellular tissue — separating the muscles — isolating the arterial trunks — burrowing beneath the fascia over the whole limb, and producing most serious, and often irreparable mischief, with violent constitutional disturbance. The bad effects of delay are again daily witnessed in neglected cases of paronychia; most excruciating pain is produced — the system is seriously affected — the tendons slough, and the member is rendered useless.

By the continued presence of purulent matter, absorption, ulceration, caries, and even death, of bone, is frequently produced, all which might have been prevented by its evacuation. If pus collect in the neighbourhood of cavities or canals, it is of the utmost importance that it be early discharged; and the evil effects of negligent and dilatory treatment are well exemplified in the following cases: — A patient had been allowed to suffer, for a long time, under an extensive abscess at the lower part of the neck, beneath the origins of the sterno-mastoid muscles. The abscess at length gave way externally; but the patient was at the same time seized with profuse expectoration of pus, and during expiration the air escaped through the external openings in the neck. It was evident that the abscess communicated with the trachea, and it also appeared to have extended deeply into the mediastinum. The patient soon perished, but there was no opportunity of examining the parts. In another case of extensive abscess at the root of the neck, an opening was proposed, but delayed. At length, the abscess gave way spontaneously; and from the circumstance of portions of solid as well as fluid ingesta escaping by the external opening, it was evident that the œsophagus had ulcerated. The cure was very tedious, but ultimately complete, and apparently much accelerated by free counter openings.

In suppuration of the cellular substance in the neighbourhood of the anus, the matter may present itself externally, whilst it is making extensive progress internally; and if a free opening is not made, fistula ani is the result. The propriety of an early evacuation of purulent matter in important, or very sensible, organs, such as the eye and testicle, is very evident.

The larger arterial and venous trunks appear not to suffer from suppuration, for in purulent depôts we find them entire, and much thickened by copious effusion of lymph into their outer cellular coat and sheath; the nerves, however, are not so much protected, or do not appear to resist the pressure and insinuation of pus, and suffer along with the other tissues.



The most convenient and effectual mode of opening an abscess is with a sharp-pointed bistoury, and the incision should vary in extent according to the circumstances of the case. The straight instrument, used as described and represented in the "Practical Surgery," p. 5*, will be found to answer best in deep-seated collections; in the more superficial it may be slightly curved. It is used as here shown, only that the edge of the knife should be turned more downwards before the integument is divided by withdrawing it. The aperture must always be made at the most dependent part, which is also, generally, the thinnest; thereby a free exit is allowed to the matter. If the incision be not made in a dependent part, a considerable quantity of the matter will be retained within the abscess, and can only be evacuated at the time by squeezing the parts — at all times a very cruel and improper practice — applying compresses, &c., which produce much irritation and unnecessary inconvenience to the patient. The cavity of the abscess inflames, the discharge becomes bloody and putrid, and great constitutional disturbance is apt to follow. When, again, the opening is sufficiently large, properly placed, and the matter flows out through the elasticity of the coverings, no air enters, the cyst gradually contracts, and the cure is soon completed.

When the abscess has been deeply seated, and the incision made through a considerable thickness of healthy parts, it is sometimes, though very rarely, necessary to introduce a small piece of lint between the edges of the wound, otherwise they may speedily adhere, and the discharge of the matter be in this way prevented. In consequence of smart hemorrhage, also, it may be proper to stuff the wound with lint, and retain it for an hour or two; but in general the practice of stuffing abscesses, or the openings into them, is hurtful. After the incision, as already remarked, it is unnecessary and injurious to discharge the pus by forcibly squeezing the sides of the abscess; the application of a poultice will promote the evacuation of the matter, and allay the irritation. In chronic abscesses of large size, it is sometimes necessary to make a counter opening — that is, an opening in a part of the tumour opposite to the original opening, in order that the matter may be more completely discharged. Setons introduced into the cavity of phlegmonous abscesses some time after their evacuation, are highly injurious, as causing much irritation in parts which are already in a morbid state of excitement; but in chronic collections, which show no disposition to heal, their use may sometimes be followed by good effects, on the same principle that they were hurtful in the preceding case; if they should not cause a sufficient degree of excitement, they may be smeared with some stimulating ointment. In extensive collections, in which the matter is not sufficiently evacuated by the external aperture, injections are by some recommended, and, perhaps, occasionally employed: in those abscesses which are comparatively recent, and in which the surrounding parts are still in a state of over-excitement, they are quite inadmissible. The employment of setons and injections in any case of abscess is not much to be commended or trusted to. Caustic, the potassa fusa, may be frequently employed with advantage for opening chronic abscesses, especially when they are the consequence of glandular enlargement, and undermine the integuments, which show no tendency to adhere to the subjacent parts. The potass is best used in the solid form and well pointed; not in paste, as is sometimes practised, By its application the unhealthy surface is destroyed, and the surrounding parts are stimulated so as to assume a sufficient degree of action to throw off the portions which have become useless, and to form new and healthy granulations, whilst the surrounding effusion of lymph or serum is for the most part speedily absorbed. But it can never be employed in acute abscesses without aggravating the disease; and in collections which are deeply seated, it cannot be of much service, for in these a considerable thickness of healthy parts must be destroyed, and if the potass be applied, it will afterwards be necessary to cut through the slough, as was practised by the older surgeons, in order to evacuate the matter and give relief to the patient; or else to continue the application of the caustic for an inordinate space of time, which is a practice altogether unnecessary, extremely cruel, and productive of much irritation, constitutional as well as local.

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* [Throughout the Elements, the edition of Practical Surgery referred to is that of 1842. Philadelphia.]

A too common result of abscess, when inertly treated, is the formation of a *Sinus;* that is, a canal, the circumference of which is condensed by deposited lymph, and which furnishes a discharge of unhealthy purulent matter, frequently thin and gleety. Several sinuses frequently unite, and evacuate their contents by one opening. Previously to treating a sinus, its extent must be carefully examined by the probe; this requires considerable caution, for the full extent of the canal may not be discovered, in consequence of its tortuous course, or from its diverging into collateral branches; or the probe, by being used too forcibly, may pass into parts altogether unconnected with the morbid cavity. Thus, in exploring a sinus at the lower part of the leg, or in the foot, the probe may be pushed to a considerable extent beneath the tendinous sheaths of the muscles, and induce the surgeon to adopt treatment unnecessarily severe. In the treatment, we may at first employ setons, injections, and graduated pressure, as formerly explained; and if these fail, the canal must be freely laid open by the knife — a mode of practice much more effectual; then there is formed a cavity similar to that of a recent abscess, and to be treated accordingly. Incision is most frequently necessary when the sinus exists in adipose substance, in tendinous structure, in parts possessed of little vitality, and in patients of a sluggish and enfeebled constitution. In sinus, as well as in chronic abscess, the potass is of essential service; a stick of it may be introduced into the canal, and if the sinus is superficial, the integuments may be divided by this caustic as effectually as by the knife. The indolent and callous surface of the sore is thereby destroyed, and the effects are similar to those which have been already mentioned, when speaking of the use of potass in abscess; in fact, by its application the sinus is transformed into an acute and open abscess. Foreign bodies, such as diseased and dead portions of bones, must be early removed; for it is to be remembered that these are much more frequently the cause than the consequence of suppuration.

The healing of an abscess which has been opened closely resembles the process of union by the second intention in a flesh wound; granulations arise, attended by the secretion of pus, the cavity gradually contracts; the surrounding effusion is absorbed along with a portion of the adipose matter; and on the granulations reaching the surface, new skin is formed, and the parts coalesce.

After abscesses have been opened, the fomentations, poultices, or warm-water dressing, as recommended in the treatment of ulcers, are to be continued, but only for a limited time. The power of the system must be carefully supported by exposure to a pure atmosphere; by nourishing food; by the exhibition of wine, tonics, and such medicines as promote digestion. In cases where the system is unusually inert, it may be proper to administer stimulants. The most powerful stimulants are frequently necessary, and by steady perseverance in the use of them, patients have often been saved in very hopeless circumstances. Great attention must be paid to the bowels, and the secretions poured into them, for on the condition and quality of these the state of the constitution materially depends. The internal use of cantharides is often advantageous in chronic suppurations and abscesses, but it is inadmissible in cases where enlarged glands occupy dangerous situations, either externally or internally; unless the tumours are in progress towards resolution, suppuration is certainly induced, and may be productive of the worst consequences. The glands not unfrequently become enlarged during the exhibition of this medicine; and such an occurrence must be watched attentively. In illustration of the good effects of stimuli in certain cases, it may be mentioned that the cavities of abscesses are often speedily effaced by granulations, and that obstinate sores frequently contract and cicatrise, after the occurrence of a febrile attack, though they had previously shown no disposition to heal.

In glandular swellings, Deobstruents, as they have been called, are used; and with this view, mercury is often had recourse to; this medicine, however, instead of producing a salutary effect, very generally tends still farther to impair the constitution. Preparations of iodine, exhibited both externally and internally, appear to be sometimes of use when the swellings have become stationary, or are inclined to subside. Iodine may be given in combination or not with iron. It is a medicine exhibited very generally and indiscriminately, and is very much more trusted to than it deserves to be. When the tumours are irritable, fomentations may be employed, and advantage taken of sea-bathing, warm or cold. The common adhesive or soap plaster, spread on soft leather, or the ammoniacal plaster, are often applied with advantage to indolent glandular swellings. Blistering is sometimes resorted to with good effect, and in some situations pressure may be usefully employed.

In the treatment of large indolent collections, it was proposed by Mr. Abernethy to make a small and indirect aperture, and to evacuate the contents of the abscess as often as the matter accumulated; but a degree of constitutional irritation frequently supervenes upon this proceeding, and the discharge becomes bloody, putrid, and mixed with a considerable quantity of gaseous fluid. The discharge of blood probably arises from the usual support being taken away from the vessels ramifying on the surface of the cavity, in the same way that blood is effused into the cavity of the abdomen, in consequence of the too rapid evacuation of the serum in ascites.

Suppuration, more especially when extensive and long continued, is attended with a peculiar species of fever, termed HECTIC. This fever is the remote consequence of local injury, or disease, whereas symptomatic inflammatory fever is the immediate one. The incessant and long-continued addition of pus to the blood may be the cause of hectic fever. In cases of pulmonary consumption, pus globules are almost uniformly detected in the blood. This fact has been noticed by Dr. Davy and Mr. Gulliver. The pus is probably carried along the capillaries, where it is always forming in chronic abscesses: in short, all the pus formed is not separated from the blood. Hectic probably arises from the never-ceasing addition of a little pus to the blood, inflammatory fever from the sudden addition of a large quantity. In long-continued disease, particularly internal, the hectic occasionally occurs before the existence of suppuration is indicated; and it does not always supervene upon suppuration, even though extensive. Hectic has been supposed to arise from the absorption of pus; but pus cannot well be absorbed without disintegration of its particles (and then it would be no longer pus), for their diameter exceeds that of the more minute bloodvessels and absorbents. Abscesses occasionally disappear, without this event being followed by any unpleasant symptom.

Hectic fever is most apt to arise in constitutions originally weak; and usually either from some incurable disease of a vital organ, or from extensive affection of a part not essential to life; but it may also be induced without any local assignable cause.

The general symptoms are those of a low and gradual fever, attended with great debility; the pulse is frequent, unequal, small, and sharp; the general surface is pale; there is flushing of the face, hands, and feet; the skin, at one period, is cold and clammy, sometimes dry and rough — at another, it is bathed in profuse perspiration, especially towards evening; chills alternate with flushing; the appetite is much impaired; diarrhœa supervenes; pale-coloured urine is voided in great quantity, often with a lateritious sediment; there is want of sleep, and great anxiety; the eyes are sunk, and of a glassy hue; the features become changed; there is great emaciation; the patient, gradually more and more weakened, falls into a state of coma, and expires.

A condition, somewhat resembling sympathetic fever, occasionally supervenes in a constitution that has been suffering from hectic, when any additional irritation occurs, and this fever has been called *Irritative.* The sanguiferous system becomes more excited — the secretions are suspended — the sensorium is disturbed; but still the symptoms are accompanied with the peculiar debility characterising the state of hectic. It frequently follows the opening of large chronic abscesses by a minute aperture, in the manner formerly described, and is relieved only by free evacuation of the confined matter.

In the treatment of hectic, the local disease giving rise to the symptoms, if it cannot be cured by other means, must be removed by operation. Thus, if hectic is consequent on long-continued, but not extensive, disease of bone, the affected portion is to be taken away; if from extensive chronic disease of an arm or leg, the limb must be amputated.

In general, the removal of the hectic cause is followed by immediate melioration of the symptoms, even though the patient has been reduced to an almost moribund condition: the feeble hectic pulse of 120 or 130 sinks in a few hours to 90, and becomes more full and strong; anxiety and restlessness cease, and a patient sleeps soundly the first night after the operation, who for weeks had scarcely closed his eyes; the cold sweats and colliquative diarrhœa immediately subside, and the urine loses its sediment; in effect, all the hectic symptoms disappear, and are succeeded by such as indicate a marked improvement in the power and energy of the constitution; and the rapidity with which these changes take place is in many cases truly astonishing. Nourishing food, wine, tonics, &c., must be given, in the first instance sparingly, and afterwards gradually increased in quantity, according as the stomach can bear them; for it is not to be overlooked, that incautious and too liberal use of them may be productive of irretrievable evils, as the action of the system may be increased beyond its resources, in the same way as the imprudent application of stimulants to a part debilitated by an excessive degree of cold causes its sphacelation, in consequence of the arterial action induced being greater than what the power of the part can support. The mineral acids may be useful in checking the inordinate perspiration; opium, astringents, and absorbents, in arresting the diarrhœa; but all are of little avail unless the exciting cause is removed, and to this latter circumstance the attention of the practitioner ought therefore to be chiefly directed. It is not always quite safe, however, to free the patient at once of a great suppurating drain. Upon the healing up of extensive and long-continued ulcers, it is often necessary, in order to prevent oppression of and congestion in the viscera of the chest, abdomen, or head, to insert an issue or seton, and gradually withdraw it. In amputations also, more especially in patients above the middle period of life, to rid them of disease which has caused hectic and wasting, in consequence of profuse discharge, it is often advisable to keep part of the wound open, so that it may suppurate, heal, and dry up slowly.

Mortification, or the death of a part, is also one of the results of inflammatory action, and the term has been subdivided into *Gan-*

grene and *Sphacelus.* Gangrene is that state in which the larger arterial and nervous trunks still continue to perform their functions; a portion of the natural temperature remains, and the part may be supposed still capable of recovery. Sphacelus, again, expresses complete death, when, putrefaction being no longer resisted, the part becomes black, cold, insensible, and fetid; but, in general, the distinction between the terms is not strictly attended to. A division of more importance is into humid and dry, or traumatic and chronic, gangrene; humid or traumatic being applied to mortification produced by external injury; dry or chronic to that resulting from a constitutional cause.

Mortification is not always a result of inflammation; it is sometimes preceded by incited action of the vessels, sometimes not. It follows as a matter of course that if inflammatory action is so violent as to cause stagnation of blood in most or all the vessels of a part, and this is continued, there must be a consequent failure of nutrition, which will terminate in mortification.

Humid or traumatic gangrene frequently occurs without previous inflammation, the injury being so severe as at once to deprive the part of its vitality. Dry or chronic mortification is often unpreceded by inflammatory action, or at least it is slight and of very short duration. It is preceded by stagnation, or is at all events coincident with this stagnation, not in the smaller vessels only, but in the trunks leading to the affected part. In humid gangrene, swelling with erethismus generally precedes the death of the parts; whereas in the dry, whether the surface change colour immediately or not, they shrink immediately. In the former they quickly lose their vitality, and consequently retain a considerable portion of their fluids; in the latter the process is much slower, and they become dry and shrivelled.

The most common remote cause of spontaneous mortification is a rigid state of the arteries, most frequently met with in the inferior extremities of elderly persons, in consequence of the deposition of calcareous matter between the internal and middle coat; this calcareous degeneration may be confined to a part of the limb, or may pervade the whole of it, and even extend throughout the arterial system. There are many cases in which disease of the arteries has existed, though no gangrene occurred; but this by no means invalidates the assertion, since, when arteries are thus affected, the part cannot withstand sphacelus when exposed to any of its immediate causes. An attempt has been made to connect mortification with an inflamed state of the arterial coats. This opinion is not confirmed by experience. Obstruction from coagulation of their contents, and inflammation of the venous trunks, sometimes precedes death of the extreme parts in old people, and seems to act as a direct cause. After wet seasons, spontaneous gangrene has prevailed as an endemial disease on the Continent, where rye is a principal article of food. The rye is subject to a disease called *Ergot;* the grains become large, black, and have a horny consistence; and the use of it, when thus diseased, is assigned as the cause of gangrene. The patients who have suffered from the use of this ergot or cockspur rye have experienced pain and heat, with swelling, generally in the lower limbs, though occasionally in the upper. These symptoms abating, the parts became cold, insensible, and discoloured, and were gradually separated from the body. The disease attacked patients of both sexes and every age, did not appear to be infectious, and was frequently fatal. It has occurred in this country from the use of unsound wheat. A tendency to mortification sometimes arises from a peculiar state of the atmosphere, want of cleanliness, poor and irregular diet, &c. Cancrum oris, for example, and sloughing of the pudendum in children, occur in those of the poorer classes who live in low, damp, and dirty situations; and little or no incited action precedes the sloughing. The same may be said of the phagedænic affections of the genital organs. Mortification and ulceration seem to differ merely in this,— in the latter, a part which, from any cause, is unfitted to remain a portion of the living body, is only prevented from dying by absorption just as it is about to lose its vitality; whilst in mortification the part perishes too soon, or in too great quantity, to admit of absorption. Sloughing phagedæna is a sort of connecting link.

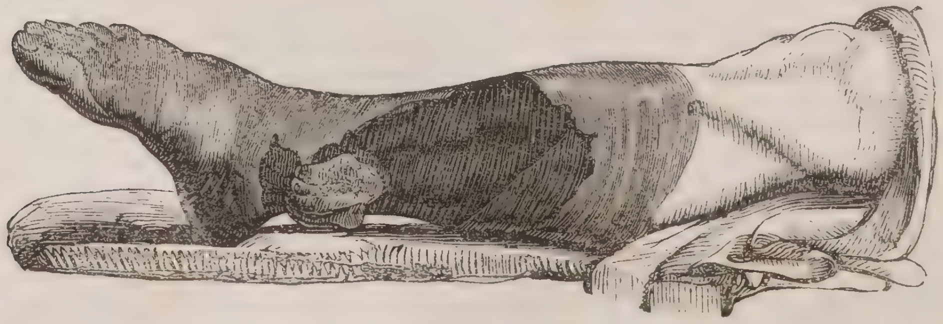
Mortification, to a greater or less extent, may be produced in any constitution, and at any age, by the application of heated substances, caustics, acids, &c.; by the effusion of acrid matter into the cellular substances, as urine or putrid sanies; by the interruption of the circulation and nervous energy, as from ligatures or improperly applied bandages — or by natural strictures, as those in hernia and paraphymosis; by continued pressure, more especially in such patients as have, from long suffering and confinement, had the powers of the circulating system weakened; and by violent contusions, as in fractures, compound luxations, and gunshot injuries. A frequent source of mortification, in inclement seasons and climates, is exposure to extreme cold. In this case, the cold is not the direct, but the indirect cause; the power of the parts is very much weakened by exposure to the low temperature, and is thereby rendered incapable of resisting the incited action which follows the stimulus of sudden transition from cold to heat, even though the degree of increase in temperature should not exceed that of the natural standard. That cold is not the direct cause of mortification, has been undeniably proved by facts derived from military practice. No symptoms of inflammation or gangrene occur when the soldier is on duty, and continuously exposed to severe cold; but they speedily present themselves after a rapid thaw has commenced, or after the soldier has imprudently approached a fire. Soon after the half-frozen person has begun to feel a little more comfortable from sudden warmth, he becomes aware of pain, attended with a sensation of itching in the extremities, generally the lower, which are considerably swollen, and of a dull red colour; these, and other symptoms of inflammation, are of no long duration, the action speedily runs its course, and the part soon plainly indicates that gangrene has commenced.

When gangrene follows the tight application of a ligature, the death of the part seems to depend more on obstruction to the circulation of the blood, than on any diminution of the nervous energy, for we do not observe that paralytic limbs are peculiarly liable to gangrene. The surgeon frequently takes advantage of the fact that a part soon dies when its supply of blood is cut off, or its return in the veins interrupted; and has recourse to ligature for removal of parts, when he considers it inexpedient to employ cutting instruments.

Mortification may be produced by the above-mentioned causes, either immediately or consecutively; and it will occur in some constitutions, or states of constitution, at some periods of life, in some structures, and in some parts of the body, more readily than in others.

Inflammatory action is seldom so intense as to terminate in death of the part, unless the power of that part has been diminished by previous local or constitutional disease, or by injury; and the inflammation preceding gangrene is all along attended by symptoms of so well-marked debility, both local and general, that it is frequently designated the Inflammatio Debilis. Of inflammatory affections, the erysipelatous most frequently terminates in gangrene; in other words, the power of resisting incited action is not so great in the cellular tissue and skin as in other parts of the body.

The period at which the symptoms of gangrene appear after an accident varies, in general, according to the severity of the injury. As was already observed, the part may be immediately deprived of its vitality — if not, symptoms of gangrene sometimes appear within a few hours after reaction has taken place; while in other cases, tension, pain, and heat occur, and may continue for a longer or shorter time, according to the degree of power remaining in the part. Tension often exists to a great extent after severe injuries, from extravasation of blood or serum; the functions of the vessels are thereby interrupted, and gangrene is inevitable. As the action proceeds, the pain and heat often subside — the parts become flaccid — dark-coloured serum is effused beneath the cuticle, forming what are termed Phlyctenæ — the skin becomes dull and livid — dark streaks extend along the limb, perhaps from the colouring matter of the blood transuding, as in commencing putrefaction in the dead body — air is effused into the subcutaneous cellular tissue, causing a sense of crepitation when pressed by the finger — sloughs form, either black or of an ash colour — and the gangrene involves a greater or less extent of the limb. The mortification is here represented as attacking a limb that had suffered from compound fracture. The dark part around and above the protruded bone was in a state of sphacelus. The dorsum of the foot and the integument towards the knee were only gangrenous. The patient was advanced in life, and the state of the constitution such as to induce a belief that there was a predisposition to mortification. The removal of the limb was, under the circumstances, reckoned inexpedient. In some instances, the mortifica-



tion is most towards the surface; in others, it is chiefly amongst the deeply seated parts. Sudden cessation of pain is generally regarded as an unequivocal sign of the occurrence of gangrene, especially in the internal viscera; but it no tunfrequently happens that the painful sensations suddenly cease, whilst no gangrene supervenes, and that a part mortifies, whilst the pain continues but little abated.

In compound fractures, dislocations, or severe bruises of the soft parts, dark-coloured, prominent points occasionally appear, in consequence of the effusion of bloody serum beneath the cuticle; in these, however, the fluid is speedily absorbed, and the surface resumes its natural aspect, the cuticle exfoliating and being reproduced; and it is of consequence to know their real nature, for, if mistaken for the gangrenous phlyctenæ, the inexperienced practitioner may be alarmed, and, consequently, have recourse to very injudicious practice.

When the process of gangrene is checked, the skin immediately beyond the mortified part becomes of a brighter hue, and is affected by a more healthy species of inflammation, which ultimately terminates in ulceration, with purulent discharge, and thereby forms what is called the line of demarcation between the dead and the living parts; the process, commencing in the integuments, gradually extends to the deeply seated parts, so that the mortified portion is ultimately attached to the living merely through the medium of bone or ligament. Arteries appear more than any other texture to resist sloughing; and those leading to a mortified part are found contracted and filled with coagulated blood, so that the spontaneous separation of the sloughs, and even incisions for their removal, made in sound parts, are followed by little or no bleeding. This salutary change in the arteries may be accounted for by supposing, that the inflammatory action which leads to the separation of the dead substance from the living affects the arteries at that point as well as the other structures, causing adhesion of their internal surface, and obliteration of their cavities; and the natural result is, that the calibre of the artery above the obliterated point gradually diminishes in size, and the blood coagulates up to the nearest collateral branch: but in consequence of extension of the inflammatory action, the collateral branches may also be obliterated to a considerable extent upwards, and thus the contraction and coagulation in the larger trunk will also extend in proportion. Besides, before the line of separation has commenced, arteries cannot transmit their contents into the sphacelated part, any more than into an extraneous body; so that the circulation of the blood in them is as effectually obstructed as if a ligature were tightly applied; in this way, also, the contraction and coagulation may be accounted for.

Mortification is accompanied with great anxiety; coldness and clamminess of the face and extremities; weak, irregular, and hurried circulation; quick, short breathing; a cadaverous expression of countenance; hiccup (which, however, often occurs in very slight sloughing, or when no sloughing has taken place, in external or internal inflammations, extravasations, &c.); by diarrhœa, vomiting, and in hopeless cases, more especially of traumatic gangrene, by delirium and coma; in fact, almost all the symptoms of severe constitutional irritation are more or less fully developed. In some cases, the patients are restless and unmanageable; in others, low and dejected. The disease often proceeds with fearful rapidity to a fatal termination, the patient becoming comatose from effusion within the cranium; but in other instances, in which the vigour of the constitution is greater, and the extent of mischief less, the system bears up under the affection, and a separation is effected between the dead and living parts. The danger is in general to be estimated by a consideration of the size and importance of the part, and of the age and constitution. The destructive consequences of sphacelus arise both from a local and general cause; for the mere application of putrid animal substance to a part still alive — the infiltration, for instance, of dark serosity into the cellular tissue in the course of a limb — causes a sort of inflammation attended with symptoms of diminished power, and followed by constitutional disturbance; whilst the ultimate extinction of life may be imputed to the effect produced on the system by the part previously to its becoming sphacelated, and to the sympathy between the system and the parts which are left in a weak and moribund condition, and which seem endowed with a disposition to extend the disease.

In the *treatment* of mortification, no one would think of using any means, local or general, so long as the cause remained; and it therefore must in the first place be removed, otherwise the mischief may speedily become irreparable; thus, a stricture must be divided, irritating fluids evacuated, foreign bodies extracted, &c.

In chronic gangrene the cause is constitutional, and the means employed must be directed accordingly. In general, the power of the constitution requires support, though, in cases where much fever is present, it may often be necessary to keep the patient on low diet: exhibit salines and mild purgatives in the first instance. The effects of food should be attentively watched, and its quantity increased or diminished accordingly. On the subsidence of the fever, and when sphacelus has occurred, wine and animal food must be given abundantly. Stimulants, strictly so called, are not admissible until the line of separation be formed, and their exhibition must then be regulated by the circumstances of the case. Opium and other anodynes are found necessary during the progress of the disease, to allay irritation and produce sleep; opium has been recommended on very high authority, that of Mr. Pott, in mortification of the lower limbs. The bowels must be attended to. Peruvian bark was at one time supposed to be a specific in this disease, but experience has not born out the opinion; it seldom agrees in substance, and the decoction, with or without the compound tincture or sulphate of quina, will be found much more useful in supporting the power and tone of the digestive organs. After the line of separation has been formed, and not till then, the surgeon may interfere, and assist nature in her work, dividing the exposed bones or ligaments by which the dead parts still adhere to the living; or he may perform amputation immediately below the line of demarcation. Amputation in the sound parts cannot be recommended: for vitality is impaired throughout the system, and more particularly near and above the line of demarcation, where, though the structure seems entire, yet the incisions are made in parts really diseased, and which would almost certainly and speedily mortify. In fact, amputation above the line of separation, in whatever way performed, is seldom if ever productive of advantage in spontaneous gangrene.

In order to prevent the occurrence of gangrene after exposure to intense cold, the frigid part must be cautiously and slowly restored to its natural temperature; first by being either placed in very cold water, or rubbed with snow; afterwards, by the degree of warmth in the applications, and surrounding atmosphere, being gradually increased.

In acute gangrene, and in robust constitutions, when the affection arises from over-action, abstraction of blood is had recourse to with marked advantage. In some cases it may be employed, but with due caution, even after sphacelus to a slight extent has occurred. In gangrene, purging and bleeding must not be had recourse to but with the greatest circumspection; for it ought always to be remembered, that however strongly they may be indicated, the time is not far distant when they will be totally inadmissible, and when the weakening effects of depletion will prove highly prejudicial, particularly in cases where the mischief is proceeding rapidly.

The loss of blood is frequently beneficial in sloughing phagedena, as is exemplified on the occurrence of spontaneous hemorrhage in such cases.

When a portion of a limb, throughout the greater part of its substance, is so injured that it evidently cannot recover, it ought to be removed instantly, and before the constitution has suffered.

When gangrene follows inflammatory action, this is first to be moderated, and then the strength by all possible means supported.

When only a portion of the soft parts of a limb is destroyed by mortification, and it is likely that the member may be saved and prove useful to the patient, measures should be adopted to hasten separation of the dead parts, and reparation of the breach in the living.

After the separation of sloughs has commenced, the attention of the surgeon is chiefly to be directed towards the constitution; it must be supported and strengthened by nourishing food, wine, and tonics, or by stimulants, if necessary. Bark in substance, acids, and other supposed antiseptics, are of but little use.

The local applications which have been employed are numerous; poultices of all kinds, charcoal, carrot, and effervescing; various lotions to the surrounding parts, spirituous applications, such as several of the tinctures, liniment of turpentine, balsams, &c., with the view of correcting the fetor. But it is evident that such applications to a dead part can be productive of no effect; the only beneficial result that can be expected from such means is removal of the fetid smell, which can be effected, if need be, by sprinkling s solution of the chloride of soda on the body-linens and bed-clothes. Scarifications are sometimes used; when these are made merely into the sphacelated part, they can be productive of good only by allowing the escape of matter; when they extend more deeply, they are injurious.

This practice, however, as will be hereafter noticed, is adopted with the best effects when mortification is threatened.*

When the sloughs become loose, they must be removed bit by bit with scissors; and when the sphacelated part has separated entirely, the healing of the breach is to be promoted by judicious dressing, bandaging, and by proper position.

In mortification of an extremity, in consequence of injury, removal of the part by incision in the sound substance was formerly as much dreaded as in chronic cases before the separation had commenced; but such fears have now subsided, and the practice of delay has been in a great measure relinquished, — amputation being performed in the sound part, at a considerable distance from the mortified or even gangrenous tissues, and during the progress of the disease, occasionally with a favourable result. If the surgeon defer the operation until a line of separation have begun to form, he will soon discover the danger of his delay; the constitution will, in the majority of cases, rapidly sink under the malady before the progress of the disease is in any measure checked, or any attempt is made to throw off the mortified parts. Two cases which lately occurred in my hospital practice, are here introduced from the "*Lancet*," to show how different the progress is, and how opposite the practice ought to be. Both the patients made excellent and rapid recoveries.

"Sarah Arnold, æt. 75, was admitted on the 26th of January. She has been a person of great mental and bodily activity, and has enjoyed excellent health from her infancy, until her present illness, although necessarily exposed, from the nature of her occupation, a gatherer and hawker of watercresses, to all varieties of weather.

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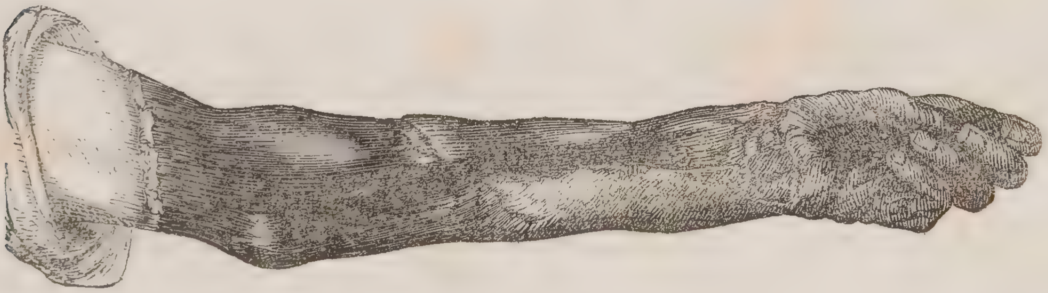
* [To prevent mortification blisters have long been a favourite means with American surgeons. The practice originated, I believe, with the late Dr. Physick, of Philadelphia, early in the present century. To do good, they should be large enough to cover, not only the whole of the inflamed part, but a considerable portion of the surrounding surface, and to be kept on until they have produced thorough vesication. Blisters are scarcely less serviceable to arrest mortification, after it has made some progress, but in this case they should be placed in contact with the sound skin, not with the dead, as they cannot, when this is done, be productive of any good.

To expedite the sloughing process, allay the unpleasant fetor, and promote the formation of healthy granulations, I know of no remedy that will answer so well as the nitric acid lotion. It should vary in strength, according to the exigency of the case, from four to twelve drops of the acid to the ounce of water, and a cloth wet with it should be constantly kept in contact with the affected part, taking care to wash it occasionally to rid it of the foul discharges with which it becomes from time to time impregnated. If necessary, a poultice can be placed over the rag. Under this treatment, particularly when aided by the liberal use of carbonate of ammonia, wine, brandy, and other cordials, I have often been astonished to witness the rapid changes that have taken place, in cases apparently of the most desperate character. — Ed.]

About six weeks ago, without being more than usually exposed to cold, she was seized with severe rigors. Two days afterwards she began to complain of slight pain, with clinching of the fingers, which at the same time became discoloured at the tips, and were partially deprived of sensation. This at first did not give rise to much uneasiness, and no treatment was employed; and it was not until a week after the commencement of the disease, when the discoloration had passed the wrist, and the hand had become dry and shrivelled, and motion and sensation in it were completely lost, that a medical man was called in. Both internal and local remedies were then employed, but without in the least retarding the progress of the disease, which in about a fortnight from her seizure had extended a little way above the middle of the humerus, beyond which it did not pass. At present there is a well-marked line of separation between the living and the gangrenous parts, but there are two livid spots beyond it, on the outer side of the arm; on the inner side, where the disease has extended a little higher up than the outer, suppuration has already commenced. The integuments in the immediate neighbourhood of the diseased parts are slightly reddened and tumefied, and it is there only that she complains of some slight pain. The hand and wrist are dry and shrivelled, but above this the parts are soft and flaccid.



Below the line of demarcation, the extremity is of a dark colour, resembling the skin of a negro, and completely deprived of the power of motion and sensation; but she complains of a disagreeable tingling, referred to the fingers. The discoloured parts are quite cold, and the pulse cannot be felt, even in the axilla. Though she complains much of debility, the system seems to be but little affected. The appetite is very good; the skin is moderately warm; the pulse is 98, and of good strength; the tongue is moist and clean. She sleeps little. ℞. *Haust. c. Sol. M. Morph.* gtt. xxv. M. *Vini Rub.* ℥iv. Water-dressing to the arm at the line of separation.

"27. She continues much the same as yesterday; slept little, bowels moved twice; tongue clean and moist; appetite very good; pulse as before; heat of skin natural; intellect clear; no expression of anxiety in the countenance. ℞. *Haust. Con. Vin.* Full diet.

"28. The suppuration on the inner side of the arm is more copious, and the discharge is more fetid. The livid spots on the outer side of the arm have not extended, and there is some slight redness around them. Pulse 104, of good strength; tongue clean and moist; heat of skin still natural; appetite good; bowels moved once since the last report. Continue. A little *Sol. Chlor. Calcis* to be added to the dressing.

"29. The dry and shrivelled state of the extremity has extended as high as the middle of the forearm. The discharge is much the same as before in quantity, but is more fetid. The separation between the gangrenous and the sound parts, which had begun on the outer side of the arm when she was admitted, is extending a little, both towards the inner and the outer side. Pulse 90, of moderate strength; skin natural; tongue clean and moist; bowels open; appetite excellent.

"30. Much the same as yesterday; sleeps a little better.

"31. The suppuration is more copious; the discharge extremely fetid. The dead parts on the inner side of the humerus are gradually becoming more detached. No change in the appearance of the living spots beyond the line of separation; pulse 102, of pretty good strength; bowels continue regular, and the appetite is good. Cont. vinum et haust.

"Feb. 2. The separation of the gangrenous parts on the inner side of the arm has advanced a little more since last referred to. The livid spots have disappeared, with the exception of the largest, where a small superficial slough has formed. The diseased parts were removed to-day, the line of separation being fairly established, and suppuration having taken place in a great part of its extent. The soft parts were divided by means of a pair of scissors, cutting as near to the living parts as could be done with safety; the bone was then denuded as high up as possible, by passing a bistoury round it, and it was then divided by the saw. There was no bleeding from the soft parts, and only slight oozing from the bone, which was found to be alive where it was divided. Cont. vinum et haust.

"3. Continues in much the same state as yesterday; pulse 104, of good strength; tongue clean and moist; bowels moved once; skin natural; appetite good; suppuration very free. Cont.

"5. Suppuration copious; a portion of the dead parts left have separated, and left a healthy florid granulating surface. Continues much the same.

"6. Discharge copious, and much less fetid; bowels regular; pulse 100, of good strength; tongue clean; appetite good; wishes for more food. To have an additional chop. Cont. alia.

"8. The greater part of the sloughs have separated, and have left a healthy florid granulating surface; no change in the general symptoms. Continue.

"9. The stump looks well, and the posterior part of the cut end of the bone is covered by healthy granulations.

"In some notes of this case, kindly furnished me by the late Professor Fergus of King's College, who had an opportunity of watching the appearances for some time before the admission of the patient here, it is mentioned that the flow of blood in the veins was exceedingly slow, and that hard knotty tumours could be felt in the parts before they became sphacelated. These swellings all along preceded the mortification. It is mentioned, besides, that the patient had a sort of fit, but that it could not exactly be ascertained whether or not she lost consciousness. Her left arm is said to have been motionles from and after that time. There is considerable discrepancy in the accounts of the mode of invasion, and of the duration of the disease, before the line of separation became apparent. A period of six weeks is stated in our case-book to have elapsed from the attack to the admission of the patient into this hospital. It would appear, however, from the other history, that not more than three weeks had passed over. The old lady is not very distinct in her account; at one time she makes a statement with great minuteness, and very soon after contradicts herself on almost every point. When pressed on the subject, she states that she got disgusted with her condition, became despondent and careless about everything, and that her recollection is not now very good."

"S. W., aged 16, was admitted March 12, under the care of Mr. Liston. She is a servant girl, of sanguine temperament and good constitution. On Friday, March 9, she was cleaning the outside of a parlour window, and stood on the sill. The window-sash, upon which she was depending for support, being suddenly drawn down by a person inside, she was precipitated into an area, a distance of fifteen feet. She was immediately picked up, and conveyed to the hospital. The house-surgeon detected a compound fracture of the ulna, and a fracture of the radius, both fractures being a little above the wrist-joint of the right arm. The fracture was adjusted, and the wound, which was inferiorly to, and behind, the wrist, dressed in the usual manner. A dose of house-medicine was administered; suitable directions were given in case of the occurrence of pain or swelling; she was sent home, and desired to remain quiet. The following morning (Saturday) she was visited by the house-surgeon, who found her comfortable, but she had passed a sleepless night. On Sunday morning the affected part became so intolerably painful that she tore off the splints and bandages, which one of the dressers of the hospital had a short time before readjusted; in the evening she was in great pain, and the arm was much swollen.

"12. To-day (Monday) she was admitted into the hospital; water-dressing was applied to the wound. The bandages were reapplied, and an anodyne administered in the evening, with the effect of producing some rest.

"13. The pain and swelling were so great during the night that the house-surgeon was called up to see her, and ordered the application of fomentations; this morning she is much more comfortable.

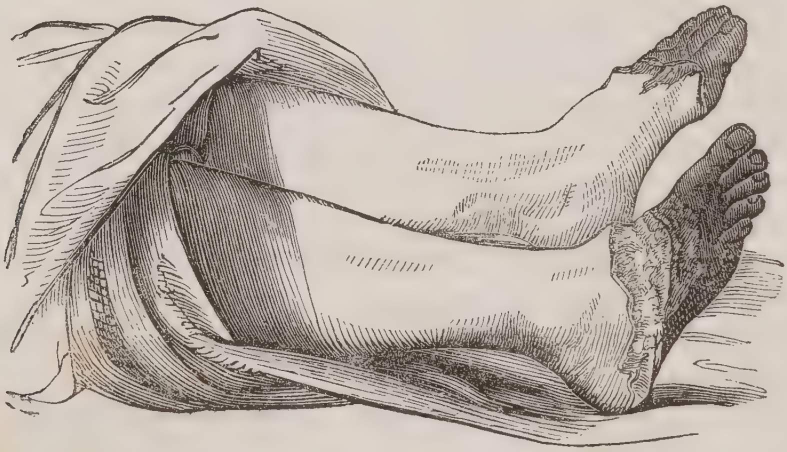
"14. On removing the whole of the apparatus this morning early, mortification was found to have taken place in the limb; at the time of Mr. Liston's visit in the middle of the day, the limb was very swollen, the fingers were of a black colour, the forearm livid, there were vesications near the elbow with fetid discharge. There was a good deal of fever with slight delirium; pulse irregular, quick. Mr. Liston considered the only chance the patient had was the immediate amputation of the limb at the shoulder. The patient's consent having been readily obtained, Mr. Liston proceeded at once to the

"*Operation.*—He first introduced a long double-pointed knife under the acromion, and brought the point out at the lower and posterior border of the axilla, by this means the joint was laid open; the flap thus formed of a portion of the deltoid was raised, and the head of the bone separated from its attachments. The other flap was formed from the integuments and muscles in front. The axillary, and one other vessel, required ligature. The edges of the wound were drawn together by three points of suture, and cold water-dressing applied. One grain of muriate of morphia was given. In the evening, several strips of isinglass plaster were applied, and the edges approximated. The delirium ceased after a short but refreshing sleep.

"15. Passed a good night; has had little pain; feels very comfortable this morning; she is cheerful, and has little fever; pulse 86, regular. The wound looks healthy.

"April 2. Since the above date, the patient has been gradually improving in her health and strength, and she is now able to walk about the ward."

In gangrene occurring after exposure to cold, amputation should not be had recourse to till after the line of separation has formed; and in this case the constitutional symptoms are much less urgent, and the object of the operation might be frustrated by its being performed in parts, which would speedily become sphacelated. The amputation may be performed either at the line of separation by cutting the ligaments or bones, as was done in the case from which the accompanying sketch was taken, and when the line of separation is well declared; or, if by these means a good covering is not likely to be had for the exposed surface, the incisions may, in these cases, be with safety and propriety made in the living tissues, at the most convenient point.



In gangrene arising from obstruction or injury of bloodvessels, in healthy constitutions, amputation must be performed early — for thus the chance of ultimate success is increased, while the danger of delay is the same as in cases of gangrene caused by severe injury.

OF ERYSIPELAS.

Erysipelas is an inflammation of the external surface, accompanied with peculiar symptoms and appearances, the morbid action being modified by the texture in which it occurs. According to the various circumstances attending the disease, it has been divided into several species: phlegmonous, bilious, œdematous, gangrenous, acute, malignant, &c. The term *Erythema* is applied to cases of rash or efflorescence, unaccompanied with fever, swelling, or vesication.

Inflammation of the skin only, is marked by bright redness, not circumscribed, and disappearing when pressed. By pressure, the bloodvessels are emptied for a time, the part sinks and becomes pale; but, on removing the pressure, it soon regains its former colour and relative situation; when these circumstances concur, the part is said to pit. There is no tension,—the pain is not throbbing, but of a burning or itching kind, and there is often a degree of œdematous swelling. Swelling does not occur to any great extent, however, during the existence of the inflammation in the skin and rete mucosum; but the parts sometimes become much swollen after subsidence of the inflammatory action, the vessels having relieved themselves by effusion of serum; and afterwards the œdematous surface often assumes a yellowish hue. In some cases, the serous effusion is from the first, more extensive than in others, and hence the term *œdematous* erysipelas, or inflammatory œdema. Upon the decline of inflammation, a serous fluid is often effused also in great quantity under the cuticle, giving rise to vesications, resembling the blisters produced by the application of boiling water to the skin; and from this circumstance, erysipelas has been classed amongst cutaneous affections in the order bullæ. The erysipelatous redness does not terminate abruptly, and is not defined by a distinct boundary, as some have asserted, but becomes gradually lost in the surrounding parts. It frequently involves the contiguous parts one after another, and extends with great rapidity. It often leaves one part suddenly, and attacks another, either in the neighbourhood, or situated at a considerable distance; in other words, metastasis takes place. The disease takes on this erratic character without our being able to assign any good reason for it; and this form of the disease is frequently attended by symptoms of typhoid fever. When it disappears suddenly, or is repelled by cold applications, affections of the internal organs sometimes supervene, as of the bowels, lungs, or brain; the diseased action leaving the external surface, and attacking the deeply-seated organs; thus, in a case of erysipelas of the ankle and foot, the external symptoms disappeared suddenly, and an affection of the lungs supervened, under which the patient sunk; and in erysipelas of the face and scalp, the sudden disappearance of the redness is frequently followed by delirium and coma. Again, in acute disease of an internal part, the symptoms are much meliorated, and often entirely removed, by inflammation of the skin being induced artificially, or occurring spontaneously.

The integuments of the face and head are frequently attacked by erysipelas, in consequence of wounds and bruises of the face or scalp, even though very slight, and it often takes place here spontaneously, as in other parts of the body.

Erysipelas commonly arises from constitutional derangement, as is shown by the symptoms which precede it, and also by the efficacy of internal remedies in checking its progress; in such instances, external applications, unaccompanied with constitutional treatment, produce little or no effect. It is often produced around a wound by the employment of improper dressing, rancid ointments, or irritating plasters, by a too free use of the part, or by the friction and irritation of the patient's clothes. It occurs most readily in those who live freely, indulging in the imprudent use of spirituous liquors, and whose constitutional powers are thereby considerably weakened. It is also said to be sometimes caused by violent passions, as anger or grief; and by exposure to cold, or to heat,—the former acting only as a remote, the latter as an immediate cause. As an example of its occurring in consequence of heat, it is a common remark, that cooks, who are necessarily much exposed to the fire, are frequently the subjects of erysipelas of the face; but in the majority of such cases, there may be other causes in operation,—the abuse of ardent spirits, and habitual overcharging of the system with stimulating food. It is more commonly met with in summer than in winter. And in certain states of the atmosphere, even in healthy situations, a degree of erysipelas is apt to occur after wounds by operation or accident.

It is often periodical, especially in females who have ceased to menstruate, always recurring at regular intervals; it attacks parts of the body, most generally the face, and in some cases monthly, in some once in the year, and in others once every two years. It sometimes appears to occur as a natural mean of relief from impending affections of more serious nature, as of the system or of internal organs. Those who have once been afflicted with the disease become more liable to its attacks.

Erysipelas is generally preceded and accompanied with more or less disturbance of the digestive organs. In *Bilious* Erysipelas, the portion of skin affected is said to present a more yellow colour than in the phlegmonous, the derangement of the digestive organs is greater, and hence the origin of the distinctive term; fits of shivering occur, the patient complains of a bitter taste in his mouth, and the tongue is furred and of a brown colour.

In the *Phlegmonous*, in which other textures than the skin are often affected, viz., the subcutaneous and intermuscular cellular tissue and the fasciæ, the pain is more intense, and of a throbbing kind; the swelling is hard, more deeply seated, and more extensive; there is considerable tension; and the redness is of a darker hue. Nausea and a bitter taste in the mouth do not precede the erysipelatous appearance, but the skin and tongue are dry, and there is great thirst. When the disease begins to subside, then the foul tongue supervenes, with the bitter taste and nausea.

Erysipelas, of a contagious and violent character, frequently occurs, and is apt to spread extensively, in badly aired situations, where a number of patients with sores are crowded together, without due attention being paid to cleanliness and proper dressing.

Hospital Erysipelas, as this species is termed, is nearly allied to that dreadful disease, Hospital Gangrene, and the two affections are often blended. It comes on after operations, or in patients who have sustained an external injury by accident. In unhealthy hospitals it not unfrequently appears in previously sound parts, and without any assignable cause; and, from its following the slightest wound, recourse cannot be had with safety even to venesection, cupping or leeching. It is a dreadful scourge in many hospitals, more especially during particular seasons of the year — during hot, damp weather, and in spring and autumn, attacking the patients indiscriminately.

Of late years Erysipelas appeared in the Royal Infirmary of Edinburgh, during the wet and changeable summers which prevailed; some of the cases were very severe, and a few terminated fatally. It was very satisfactory, however, to observe that it did not spread as it used to do formerly, that patients occupying the beds immediately around those affected, though afflicted with sores and in indifferent health, remained exempt from the disease; and that many of the most severe cases did not originate in the house, but were brought from the crowded and unhealthy parts of the city. The same may be said of the disease as it has shown itself in the North London Hospital since it was opened for the reception of patients up to the present time.

Hospital Erysipelas is for the most part preceded by violent constitutional symptoms, derangement of the chylopoietic viscera, shivering, brown tongue, and a bitter taste in the mouth; if there is a sore on the body, it assumes a sloughy aspect; the surrounding skin becomes of a dark red colour, and there is a feeling of tension, accompanied with a burning pain. The erysipelas extends rapidly, and generally terminates in suppuration and sloughing of the cellular substance, or, if inertly treated, in immediate gangrene of the parts. The concomitant fever is generally low, and though, in the first instance, the circulation may be vigorous, symptoms of debility will speedily appear. It will be more fully dwelt upon, along with Hospital Gangrene.

In all cases of erysipelas there is more or less concomitant fever, modified by the extent of the local affection — by the age of the patient — by the previous habits and state of health — by the constitution — and by other circumstances. The pulse is accelerated, and is either of a sthenic or asthenic character, according to the state of the system and type of the prevailing fever. There is headache, languor, thirst, restlessness, and even delirium, especially when the face or scalp is the seat of the disease.

Erysipelas may terminate in resolution. If this takes place in the first stage of the disease, the redness gradually declines, along with the swelling, the cuticle exfoliates, and the part regains its usual appearance, the skin remaining loose and shrivelled. If it occurs after vesications have formed, the effused fluid is absorbed, a scab forms, and desquamates along with portions of the cuticle.

It may terminate in suppuration, when the inflammation has extended to the cellular substance. This termination is most frequent when the disease is situated in an extremity, seldom when in the face, though small purulent collections occasionally form in the eyelids. Circumscribed collections of pus often present themselves after the disappearance of the erysipelatous inflammation; but the purulent matter is generally diffused through the filamentous tissue, and is of a thin, unhealthy appearance, and mixed with sloughs of the cellular substance. By the infiltration of matter, the integuments, fasciæ, and muscles are extensively separated from each other, in consequence of which the parts frequently die, their nutritive supply being cut off.

Acrid sanious matter is often infiltrated extensively into the subcutaneous cellular tissue round a wound or sore. The superimposed integuments are of a dark brown colour, and the part is boggy. Sloughing of the cellular membrane here takes place in consequence of the infiltration, and not from inflammatory action having been established. The affection has been termed Diffuse Cellular Inflammation, but a more proper appellation is Diffuse Cellular Infiltration; the cellular tissue, even where treatment is adopted at an early period, can scarcely be prevented from perishing.

Erysipelas, if properly treated from its commencement, will seldom terminate in gangrene of the skin. This termination is occasionally observed, however, in patients whose constitutions have been extremely debilitated.

In mild cases of erysipelas, attention to the state of the bowels, and regulation of diet, will often be sufficient to remove the disease. When there is much disorder of the digestive organs, and particularly of the biliary secretions, emetics may be given at the commencement; these are productive of but little good in the more advanced stage, and their place is advantageously supplied by nauseating doses of antimony, combined or not with purgatives. One-eighth of a grain of tartarised antimony may be given in solution every hour, with or without a due quantity of the tart. potassæ and sodæ, or Rochelle salt. The hydrargyrum cum creta is often given with great benefit when the tongue is dry and covered with a brown crust: it may be combined sometimes advantageously with the compound powder of ipecacuanha. With the same view calomel with antimonial powder may be exhibited. The exhibition of saline purges is attended with great good in some severe cases. Such medicines tend to subdue any arterial excitement that may exist, evacuate the bowels, promote perspiration, remove the superabundant bilious matter, and serve to restore the healthy functions of the liver. In severe cases, more especially of phlegmonous erysipelas, in which there is acceleration of the pulse, and a degree of febrile excitement, general bleeding may be had recourse to; but it must be employed with caution, for the symptoms of increased vascular action may arise from constitutional irritation, and not be meliorated by the depletion. The practice is superseded by the timeous and free local bleeding from incisions, as will be noticed by and by. The exhibition of the extract of aconite in this and other inflammatory affections, is often followed by great abatement of vascular excitement, so that the necessity for abstraction of blood is done away with. The medicine may be given in doses of half a grain in substance, or dissolved in pure water, and repeated every third or fourth hour. The sensible effect is relaxation of the surface, and frequently profuse perspiration; the arterial pulsations are diminished in frequency and force. The extract of belladonna, in doses of one-sixteenth of a grain, may then be substituted with great advantage, and often with the most extraordinary effect upon the disease. In very many cases, the strength is from the first to be supported by all possible means, by nourishing diet, by the exhibition of wine, quinine, and other tonics; more particularly in old people — in constitutions debilitated by disease — in unhealthy situations, and when the fever is of a typhoid kind. Bleeding by leeches is not admissible, for the leech-bites prove a source of irritation, and are liable to suppurate; erysipelas has often been produced by leeching.

In erythema, the mere outer surface of the skin only being slightly affected, and not to any very great extent, advantage sometimes results from the application of nitrate of silver. A strong solution may be pencilled upon the part, or, after being wetted, the affected surface may be gently rubbed over with the solid caustic. The pain and uneasy sensations in the part being thereby diminished or removed, and extension of the disease seeming to be arrested. Discoloration caused by such practice is of little consequence, as desquamation must follow. It is questionable how far it may be safe to apply lunar caustic to any extensively inflamed surface, more especially of the head and face, lest metastasis should occur. The inflammatory action in the skin is subdued by the application, whilst it may advance, in the cellular tissue, to suppuration and sloughing, if other means are not adopted; and from the hard and blackened state of the cuticle, the condition of the subjacent parts is not readily perceived. The remedy is only applicable to erythema, and most advantageously as a means of bounding it. The line should be drawn at some distance from the affected tissues; and if so, it is seldom that the disease oversteps it.

Local abstraction of blood, by puncture or incision, proves exceedingly beneficial in cases of erysipelas, whatever its degree. It must be borne in mind by the practitioner, when called to treat the disease, that the state of parts is very various, and this may depend upon the original nature of the disease, upon its site or duration. The surface of the skin only may be affected — that and the subjacent cellular tissue may be involved, gorged with serous, lymphatic, or purulent infiltration — there may exist great tension of the parts, with a sloughy state of the cellular tissue, established in addition to suppuration — and again, there may be infiltration of the subfascial and intermuscular tissues, leading ultimately to exposure and exfoliation of bones or disease of articulations.

From inattention to these circumstances, the treatment being often directed to the name of the disease, great discrepancy of opinion, as to the most proper local management, has arisen; there has accordingly been a controversy as to whether the blood should be drawn from mere punctures from limited incisions, or from long gashes extending from one joint to another.

In cases not very severe or extensive, when the skin only is affected, the constitutional treatment already mentioned is first to be employed, and then the affected part must be freely punctured with a fine lancet, at numerous points, as recommended by Sir R. Dobson. These punctures should reach the vascular layer, but not go deeper: the serous effusion, if there be any, is thereby evacuated — the over-distended vessels are relieved of a considerable portion of their contents — and the œdematous swelling, with the formation of phlyctenæ, is prevented. The part is afterwards to be fomented for half an hour, or an hour, with bags containing chamomile flowers or hops; the fomentation, repeated at intervals, proves highly grateful to the feelings of the patient, allays any irritation which the making of the punctures may have produced, and keeps the skin perspirable. Under this treatment, every vestige of erysipelas will generally disappear in the course of a few days. In more severe cases, especially in the extremities, the parts must be freely incised. The incisions ought to extend through the integuments and cellular substance, and their length and number must be proportioned to the extent and severity of the affection. One or two pretty free incisions, if made in the proper place, where the greatest degree of boggishness, marking the disorganised state of the tissues, is discovered, will generally suffice — the vast good and the relief afforded depends partly upon the abatement of the tension, in consequence of the evacuation of the effused fluids — upon the unloading of the over-distended bloodvessels of the part, and upon the acceleration of the suppurative process, which is often critical. The constitution is, probably, relieved by the suppuration of the wounds, and the consequent drain of the offending particles.

Some surgeons have disapproved of long incisions, alleging that they are tedious in healing, and prefer making numerous small ones; but it is difficult to understand how the cure should be more tedious in the one case than in the other, when the actual extent of divided surface is the same. According to my experience, several free incisions are made with less pain than a number of trifling scratches, and heal as soon, whilst by the former the purpose of the practitioner is much better fulfilled: the same good effects result from them as from punctures in the more slight cases, if they are made at the commencement of the disease; and if the affection is in its advanced stage, the effused fluid, and the sloughs, are discharged, and the infiltration of pus, and destruction of parts in consequence of the matter being confined, are prevented by its being allowed a free exit as soon as it is formed. Incisions then are made both in the early stage of the disease, and after effusion has occurred: in the former case, they are justifiable, because they arrest its progress; in the latter, they are absolutely necessary, to prevent its injurious effects. The parts are to be fomented, and afterwards covered with a common poultice, containing no oil or grease, or with soft lint saturated with tepid water, and covered with oiled silk, to prevent evaporation.

When the erysipelas has gone off, the incisions are treated as common wounds, by dressing and bandage. After punctures, or incisions, more or less blood is allowed to flow, according to circumstances. It often escapes from the vessels of the part in great profusion; this, in many cases, may be prejudicial or excessively dangerous. In the extremities the flow can readily be arrested by elevation of the part, or by pressure, for a short period. In erysipelas of the face, punctures are preferable to incisions, as by the employment of the former the countenance is no way disfigured; if, however, in erysipelas of the scalp, the integuments become swollen, and present a puffy feeling, whilst at the same time cerebral symptoms supervene, free incision or incisions, through the whole thickness of the covering, and in the direction of the fibres, must be made. If erysipelas be thus actively treated, it may be safely affirmed that the disease will not often, unless accompanied with symptoms of putrid fever, terminate fatally; if these means are employed early, the constitutional disturbance will be modified or prevented, and no derangement of the cerebral functions will ensue.

Powders, such as flour, chalk, and camphor, &c., have been applied to the erysipelatous surface, but are of little use, and, by their irritation, frequently prove injurious on the bursting of the vesicles. They are applied, according to some, with the view of cooling the surface, and after all the part may be seen enveloped in folds of flannel. Cold application, such as the spirituous and evaporating lotions, containing vinegar and spirits, liquor acet. ammoniæ, Goulard's extract, &c., may, in many cases, afford temporary relief, but their use is fraught with the utmost danger; for their direct tendency is to produce metastasis, and if that be to an internal organ of importance, the result is too generally fatal. Or if the erysipelas, on leaving the part originally affected, attack another also superficial, the local treatment has to be commenced anew. If these lotions are to be employed at all in this disease, they must be made tepid.

In case of the translation of erysipelas to any important part, blisters may be applied to the surface which it has left, or to any other in the neighbourhood, with the view of recalling the disease to its original and less dangerous situation:* the actual cautery has even

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* [In this country no remedy is perhaps more frequently employed in the treatment of erysipelas than blistering. In my own practice I have constantly resorted to it for the last fourteen years, and in no instance has it disappointed my expectations. Not only do I consider it as perfectly free from danger, an objection which has sometimes been alleged against it, but I know of no measure so well calculated to afford prompt and effectual relief. My practice is to apply the blister directly to the inflamed surface, together with a small portion of the healthy skin, and to keep it on until it produces thorough vesication. The vesicles are then opened with a needle, and the part covered with a light emollient poultice or the warm-water dressings. In children, and persons of a nervous delicate constitution, or whose health has been previously much impaired, the blister must be removed in from three to six hours, otherwise serious local mischief may be induced. This treatment, although applicable to every species of erysipelas, is particularly valuable in the phlegmonous form, no matter where situated, whether in the face, eyelids, scalp, trunk, or extremities.

Another remedy which has been extensively employed in this been recommended. In the great majority of cases, however, such means are unavailing.

In Hospital Erysipelas, purging cannot be carried to any great extent with safety, and general bleeding is seldom if ever admissible, unless the patients previously robust and in good health, in whom the disease has occurred in consequence of their being conveyed to a distance and during hot weather, after an accident or wound, and in whom the fever is of a violent inflammatory nature. In civil hospitals, the patients are generally in a weak state before the accession of this disease; and in their case, after the stomach and bowels are regulated, stimulants are more requisite. Great attention must be paid to cleanliness, the sores must be frequently dressed, and the same sponges must not be used for different individuals: in order to prevent contamination by the promiscuous use of sponges, it is better to clean the parts around sores with lint or tow, and to destroy immediately such dressings as have been used. The apartments must be well ventilated, and those who are affected with the disease should be separated from the rest of the patients. The local applications will vary according to the particular circumstances of each case. Strong escharotics may be required to clean the surface of the sores, and put a stop to the sloughing. The nitric acid will answer the purpose well, and is less objectionable than some remedies that have been used; such as the arsenical solution, or the red hot iron.

OF FURUNCULUS AND ANTHRAX.

Furunculi, or Boils, most generally occur in unhealthy constitutions, particularly in those individuals who are habitually addicted to the use of ardent liquors: they seem to arise from, at least they follow, disorder of the digestive organs. Their seat is in the skin and subjacent cellular tissue.

They generally occur in those parts which are possessed of little vitality, as in the back, buttocks, shoulders, the posterior part of the neck, &c. They are seldom single, are often numerous, and vary in size from a pea to a pigeon's egg.

A boil is of a conical form, elevated above the surface of the body; its base is hard and firm, whilst its apex is acute, soft, of a white colour, and exceedingly painful; the pain experienced in the tumour

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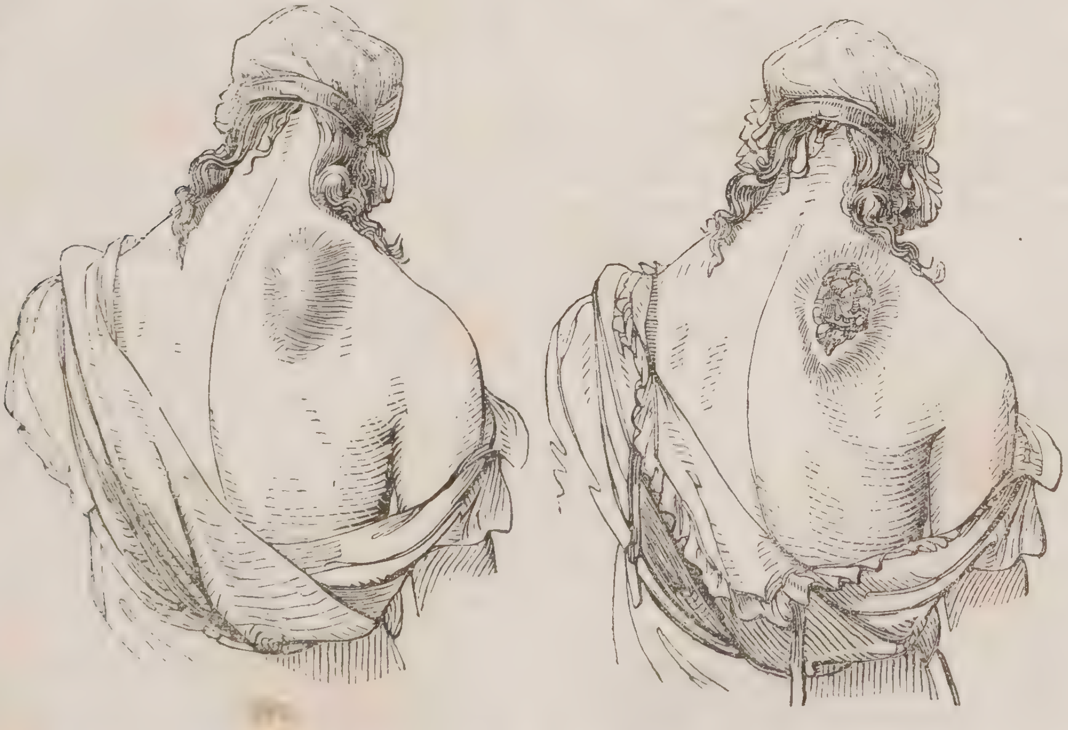
country, is the *mercurial ointment*, first recommended to the notice of the profession by Dr. Dean and Dr. Little, of Chambersburgh, Pennsylvania. My own experience, however, does not enable me to offer anything in its favour. Indeed, if at all useful, it can only be so, it seems to me, in the milder forms of the complaint: in the more severe grades it should never be resorted to, as it is far inferior to blistering, or scarification, as practised by Mr. Liston. The ointment should be perfectly fresh, and be applied upon soft linen, at least twice a day. Professor Velpeau has recently recommended methodical compression by means of the roller, and from some cases which he has published in illustration of his method it would seem to be entitled to further trial. —Ed.]

is severe and burning. From the comparatively trifling nature of the affection, the assistance of the surgeon is seldom required, and hence the apex of the tumour generally gives way either spontaneously, or in consequence of being scratched by the patient, or rubbed by the clothes; the purulent matter, which is generally small in quantity, and mixed with blood, is thus discharged. This, however, is attended with but little relief in bad forms of the affection; for at the lower part of the cone is situated a considerable quantity of mortified cellular tissue, which must be evacuated before the cavity can heal.

In this unhealthy species of inflammation, resolution cannot be expected; on the contrary, suppuration is the natural termination of the disease, and must be hastened by poultices and fomentations. A simple or crucial opening, according to circumstances, must afterwards be made in the apex of the tumour, so that the sloughs of the cellular tissue may be permitted to escape readily. In the advanced stage, the sloughs are the irritating cause by which the inflammatory action is prolonged, and on their removal the cavity contracts speedily.

If there is much derangement of the digestive organ, it may frequently be found necessary to administer an emetic. If the bowels are slow and the liver torpid, calomel and antimony are highly useful, or other mercurial preparations may be given, in combination with active purgatives; if the state of the secretions is more natural, these medicines may be administered in alterative doses. The mineral acids are often usefully administered, with the view of removing the disposition to the formation of boils. Twenty minims of the aromatic sulphuric acid may be given twice or thrice a day in any convenient vehicle. Anodynes are occasionally required.

Anthrax or *Carbuncle* may be considered as a severe form of boils It occurs in the plague, and is a characteristic symptom. It appear. in the same parts, and apparently from the same causes, as the boil. The tumour is of a more flattened form, slightly elevated above the



surface, and frequently of great extent; the base is deeply-seated, hard, and unyielding. The integuments are at first of a bright colour, but afterwards assume a dark-red or reddish-brown hue. The pain is violent and burning. The process of suppuration is very tedious, and the matter that is formed is small in quantity. If the tumour is not interfered with, ulceration occurs in its surface, producing various apertures, through which the matter is evacuated, the discharge is thin and unhealthy, excoriating the neighbouring surface; and the mortified cellular tissue, remaining at the base of the swelling, keeps up the irritation. The extent of a carbuncle is frequently great, both as to width and depth; on the back, or buttocks, it not unfrequently attains an immense size. In one instance, the whole posterior part of the neck was involved; the cellular tissue, muscles, and tendons, sloughed; and the vertebræ were ultimately exposed. In another case, the whole occiput, the posterior and lateral parts of the neck, and the space betwixt the shoulders, exhibited one continuous mass of carbuncle. By making free incisions, procuring early separation of the sloughing parts, and supporting the strength of their constitutions, both patients recovered, though considerably advanced in life.

It seldom occurs in the face or head, and when it does, it generally proves fatal. In a male patient in the Edinburgh Royal Infirmary, aged forty-eight, a carbuncle of the size of a very large orange was situated in the centre of the forehead; by active local and constitutional treatment, he soon got well.

The affection is sometimes attended with typhoid symptoms, rigors, profuse perspiration, nausea, vomiting, disordered bowels, loss of appetite, anxiety, restlessness, difficult respiration, palpitations, faintings, pale-white tongue, low pulse, pale or turbid urine, headache, giddiness, drowsiness, and, in severe cases, with delirium. In old or exhausted patients, the prognosis is unfavourable.

An early and free incision must be made into the tumour; if the swelling is large or extensive, the preferable form of incision is the crucial; the ill-formed matter is thus evacuated, the slough exposed, and more readily allowed to escape. If the mortification of the cellular tissue be extensive, and the sloughs prove firmly adherent, the free employment of the caustic potass will be found of much service, the half-dead cellular substance being thereby completely destroyed, and the surrounding parts stimulated to a new and superior degree of action, necessary for the removal of the mortified parts, and reparation of the breach of surface. Poultices and fomentations may afterwards be employed, followed by the warm-water dressing, medicated or not. The stomach and bowels must be put into proper order by the exhibition of suitable medicines; and the vis vitæ may be still farther supported by the administration of tonics and stimulants. If, after the separation of the sloughs, the exposed surface shall assume an indolent or debilitated action, stimulating dressings, such as turpentine liniment, or elemi ointment may be employed.

Such practice will be found sufficient to procure a speedy and favourable termination of the disease, in this country, where we have not to combat any of those malignant diseases with which carbuncle is accompanied in other climates.

OF INFLAMMATION OF THE MUCOUS MEMBRANES.

Mucous Membranes and the skin are analogous in structure, somewhat similar in function, and sympathise closely with each other in health and in disease. Both are endowed with that peculiar degree of sensibility which enables them to bear with impunity the impressions of foreign bodies; and both are protected from the influence of these bodies by an inorganic covering; the cutis and rete mucosum by the epidermis; the corium of mucous membranes by a laminated epithelium. They are the seat of all excretions, and by them all substances are introduced from without into the system. The capillary portion of the vascular system appears to have somewhat the same arrangement in both; the distribution of blood to the mucous membranes being, however, more copious. At the commencement and extremity of the alimentary canal, they insensibly pass into each other by means of an intermediate structure, of which the prolabium may serve as an example. In particular circumstances, they change into each other, both in appearance and in function. Thus, in prolapsus of the gut or of the vagina, the discharge from the protruded mucous surface after a time subsides, the rugæ disappears, the membrane becomes thickened and indurated, and gradually assumes an appearance exactly resembling that of the skin. In natural paraphymosis, the delicate membrane which, in the healthy state of parts, lines the internal surface of the prepuce, becomes converted into a cuticular covering. In neglected and long-continued excoriation of the nates, the raw surface, which was at first tender and irritable, and discharged a serous fluid, becomes villous, less sensible, and discharges a fluid similar to a mucous secretion. In sinuses also of long duration, the secreting surface becomes changed, so as to resemble a mucous membrane, and the discharge, from being purulent or gleety, becomes mucous, or at least resembles a mucous fluid.

A mucous surface, when inflamed, has for a short time, perhaps, at first, its functions suspended; it then furnishes a secretion, increased in quantity, and but little changed in appearance from the healthy fluid; afterwards the discharge resembles purulent matter, and is termed muco-purulent. When, however, the inflammation is violent, the discharge becomes bloody, or is altogether suppressed, and the membrane is thickened. Inflammation of a mucous membrane is very apt to spread with great rapidity, in this respect resembling the corresponding affection of the skin. It is attended with a sense of itching, and a burning pain. This pain is much increased by the muscles surrounding the parts being thrown into action, as in expelling their contents, more especially if these be of an acrid quality. The membrane is thickened, and of a spongy appearance; its surface is red, and sometimes covered with flakes of lymph; occasionally it is much softened, and coated with a viscid adherent mucus; and it would appear, in many instances, that, in acute inflammation, the membrane is generally softened, whilst it becomes indurated from chronic inflammatory action. When the inflammation is violent, and consequently rapid, considerable quantities of lymph are effused either on the surface of the membrane, or into the submucous tissue: and the lymph subsequently becoming organised, the membrane is much thickened, and a contraction is the consequence. The functions of a part lined with mucous membrane are more or less deranged, in consequence of the vitiation of the secreted fluid.

In inflammation of this tissue, metastasis is also apt to occur, from one part of the membrane to another, and from the membrane to the external surface. Cynanche, for instance, often follows upon erysipelas of the face and scalp, and *vice versâ.*

The passages, the internal surfaces of which are invested by a mucous membrane, are those subservient to respiration, nutrition, generation, and the urinary secretions; in other words, the mucous surfaces are the Pneumogastric and the Genito-urinary. Their particular diseases will be treated of hereafter.

OF INFLAMMATION OF THE SEROUS MEMBRANES.

On such an extensive subject it is unnecessary to enter fully; not that the inquiry is uninteresting, or that a knowledge of the diseases of the internal cavities, and the mode of treating them, is not required of the surgical practitioner before he can enter into practice, with safety to his patients and comfort and satisfaction to himself, but we have a very important class of diseases to bring under review in a limited space, and it is properly the province of others to treat of internal disorders, and to describe the best mode of alleviating or curing them. It is, however, the duty of the surgeon to treat the inflammatory affections of some of the serous membranes, and the consequences of inflammatory action in most of them; and it is therefore highly necessary that he understand the symptoms, progress, and consequences of such actions. The affections of the serous membranes are principally under the management of the physician; but they not unfrequently follow wounds and surgical operations, and the diseases of several of them are purely surgical. Inflammation of a serous membrane is attended with heat and pain, aggravated by motion of the parts and by pressure; the natural secretion is increased in quantity, the process of exhalation being incited, and that of absorption weakened; the serous fluid accumulates. The secretion becomes altered in quality, and assumes a milky appearance; lymph is effused, generally mixed with purulent matter, and floats in the fluid, or adheres to the surface of the membrane, which is rough and flocculent. The adherent lymph becomes organised, being penetrated by numerous bloodvessels; and thus the original membrane is, in many instances, much thickened, chiefly from the addition of new matter, though also from enlargement of its bloodvessels and opening out of the primitive tissues, principally the subserous cellular. When inflamed serous surfaces, which have been altered, both in texture and function, in consequence of inflammatory action, remain for a short time in contact with each other, lymph is effused and penetrated by bloodvessels from each surface; thus the new deposit is organised, and forms a medium of connection. By this process the parts are intimately united to each other, and consolidated into one mass; or are merely approximated, and joined, at one or more points, by portions of lymph, in some cases thin and narrow, in others extensive and of considerable thickness; the adhering bands either extend in a straight direction, from one surface to another, or interlace, forming a sort of network. After adhesions of various kinds have been formed, they are often lengthened and attenuated in consequence of the motion of the parts, as is particularly the case with adhesions between the pleura costalis and pulmonalis. When they have been of considerable duration, they often resemble the original membrane from which they were deposited, becoming thin and transparent, smooth on their external surface, and furnishing a serous secretion. Not unfrequently, inflammatory action in this tissue terminates in suppuration; and the pus, secreted by the membrane, accumulates in the most dependent part of the cavity. By collections of matter, whether serous, seropurulent, or purulent, within a serous cavity, the functions of the contained viscera are deranged, much impeded, and in many instances morbid actions are excited in them. The inflammation, whether it terminate in resolution, or proceed to serous effusion, adhesion, or purulent secretion, is attended with constitutional disturbance, and the symptoms are proportioned to the original intensity of the action, and the extent and kind of its termination. The effusion of lymph, and consequent adhesion, is, however, in many circumstances, a highly salutary process, as in wounds and injuries of the hollow viscera: effusion of their contents being thereby prevented, and the patient being saved from the danger attending violent inflammation of those cavities and their coverings, caused by the escape of a greater or less quantity of irritating extraneous matter. Purulent collections also, in the solid internal viscera, are thus allowed to discharge themselves externally. The nature, symptoms, and consequences of inflammation of serous membrane, will be more fully considered under the diseases of particular parts.

OF INFLAMMATION OF TISSUES COMPOSING THE ARTICULATIONS.

Inflammation of the synovial surface occurs in consequence of wounds, bruises, or sprains, and often from exposure to cold; from the latter cause, the knee and elbow joints most frequently suffer, as they are generally more exposed to its influence, and not so well covered with muscular substance as the others. Constitutional diseases, such as certain fevers, are followed sometimes by effusion of serous fluid into joints. Purulent matter is also deposited in joints during certain forms of suppurative fever; and this is attended by rapid change of structure.

There is heat, throbbing, pain, and swelling of the part, sometimes redness of the surface, and great constitutional disturbance; the symptoms and appearances, however, vary much, according to the extent of the joint which is involved. When part of the capsule is affected, the inflammation spreads rapidly over all the surface; the synovial membranes resembling the serous in this respect, as well as in healthy structure and function. Like the serous, too, they are shut sacs, are smooth on their surface, and furnish a secretion, the synovial, for facilitating the motion between opposing surfaces; it is, however, somewhat more glairy than the serous. Neither, in their healthy state, are possessed of much sensibility, nor are ligaments, tendons, tendinous sheaths, and bursæ, which two latter textures resemble in every respect the synovial; when inflamed, they become most exquisitely sensible. The incited action of the bloodvessels is followed by increased discharge, which is less glairy and albuminous, partaking more of the serous character. When the incited action soon terminates, and the activity of the absorbents is diminished, the fluid accumulates within the joint, producing *Hydrops Articuli.* This accumulation of fluid in joints may take place without being preceded by any apparent inflammation, and may remain a long time without any visible change of structure in the membrane. The knee is more frequently the seat of dropsy than any other joint.

When the action is more violent, and is not actively opposed, lymph is effused on the inner surface of the membrane, or is deposited amongst the ligamentous and cellular tissues external to the joint, in consequence of which, the membrane and external ligaments become thickened, and of an almost cartilaginous consistence. Serum is effused into the more superficial cellular tissue, filling up the hollows around the joint, concealing the protuberances of the bones, and producing a globular swelling. The articulating surfaces become ulcerated, and matter forms within the capsular ligament; or the pus is deposited exteriorly to the joint, and gradually approaches the surface. But although ulceration is so prone to occur in the cartilages, the synovial membranes do not readily take on this action, unless from the progress of matter, formed within the joint, towards the surface. The synovial lining of the bursæ and sheaths of the tendons are extremely indisposed to ulcerate; and it may be remarked, that, while suppuration without ulceration is common in the synovial membranes, the cartilages, on the other hand, afford frequent instances of ulceration without suppuration, of which more particular mention will be made in the sequel. The cartilage is occasionally swelled and softened where the disease has long existed.

Along with ulceration of the cartilage, a portion of it may become dead, or either state may occur separately; and in many cases, the substance of the bone also becomes affected, of which two classes of cases may occur, viz., great inflammation on the articular surface of the bone, with separation of the cartilage by the ulcerative process in this situation; and inflammation of the medullary web, leading to atrophy of the cancelli, collections of pus therein, or even death of a portion of the spongy texture of the bone, as will be more particularly treated of in the chapter on diseases of the osseous tissue. These changes often compose the primary disease, and to them the affections of the synovial membrane and other parts succeed.

Such occurrences are attended with alarming disturbance of the constitution, with fever, and even with the most threatening and dangerous symptoms, such as delirium and coma. If the patient survive, and the matter be evacuated from the joints by openings into its cavity, hectic fever is almost certain to supervene.

An opinion has been broached lately by Mr. Key, that the ulceration of cartilage was consequent upon the increased vascularity and thickening of the synovial membrane, that the cartilage, in fact, was removed by the action of the vessels ramifying in the membrane, and the prolongations or fringes from it in its diseased condition. Occasionally these fringes correspond, in a remarkable manner, to the breach of surface in the cartilage; but again, ulceration is frequently met with far removed from the membrane. It is also seen, in cases where an opportunity is afforded of making the examination in the earlier stage of disease, that ulceration exists to some extent whilst the synovial membrane is unaffected. And certain cases, in which the cartilage is affected with hypertrophy, and the common form of atrophy of this part in old people, are altogether adverse to Mr. Key's views. When ulceration takes place at a point removed from the attachments of the synovial membrane, it appears to proceed more frequently from the attached than from the free surface of the cartilage; then the adventitious membrane occupying the rugged spaces, and which under the microscope appears highly vascular, is connected apparently with the medullary web.

In acute inflammation of the synovial membrane, and in cases where the cartilage is ulcerated, the pain is very intense, and the spasms of the limb most distressing. This happens when the surface is ulcerated, and perhaps to no great extent. We know that in the horse an ulcerated hollow in the cartilaginous covering of the navicular bone, not so large as to contain a grain of barley, will cause such lameness and suffering as to render the animal so affected perfectly useless. If he is not destroyed at this stage, as many valuable animals have been, the mischief extends, and terminates in extensive disease of that and the neighbouring bones and articulations. It is different if the disease commence, as it sometimes does, in the human subject, in the cancelli of the bone, and on the attached surface of the cartilage, the free surface remaining some time entire and smooth. When the synovial membrane is primarily affected by chronic disease, the pain is in general trifling, often not complained of, and swelling of the part, from effusion, into the joint or neighbouring bursæ, first attracts attention, after it has existed, perhaps, in a slight degree, for a considerable time. The joint is stiff, and pain is experienced from extensive motion; on this account the patient is disinclined to use it, and it is soon tired by the slightest exertion. The swelling becomes more solid, though still remaining elastic, and the feeling of fluctuation diminishes. Effusion of lymph follows that of serum, the latter having been absorbed; the motion of the joint is still further impeded, and the articulation is distorted; the patient keeps the limb in the most easy position, generally that of partial flexion, in which it becomes almost immovably fixed. The cause of the flexed position, which is almost pathognomonic of knee disease, being preserved, seems to be that the limb is insensibly brought into it in order to take the pressure off the interarticular apparatus, the ligamenta mucosa and alaria,—these swell—the muscles of the hamstrings get contracted from habit, and a difficulty, even after the disease is completely subdued, is often enough experienced in procuring complete extension. The muscles, from disuse, shrink, the adipose substance is absorbed, the shafts of the bones also are diminished in size, get into an atrophied state, as the phrase is, and thus the whole limb is rendered slender and wasted, so as to make the swelling of the diseased articulation still more conspicuous. The bones are softened, and the muscles are of a white colour, as in the limbs of the paralytic or bedridden, and resemble more cellular than muscular tissue. The wasting of the muscles and loss of power often precede the appearance of disease; this is frequently observed in the shoulder-joint, the deltoid shrinking, and almost disappearing, before any disease in the articulation is suspected by the patent. Not unfrequently, also, this wasting occurs without obvious cause, or any affection of the joint. When the disease is advancing, the patient may feel no acute pain, but merely a reluctance to use the limb; and from this, if long continued, the muscles, and afterwards the bones, become wasted. Wasting of the limbs in children, often of one of the lower, frequently arises from disorder of the bowels, and the irritation and debility attendant on teething. This must be distinguished from the wasting accompanying diseased joint. The history of the case, the period at which the weakness of the limb was observed, and its appearance, will lead to a correct diagnosis.

The swelling is often irregular, being more protuberant at one part than another, from the fluid or the addition of solid matter being accumulated where the least resistance is afforded; but the slighter inequalities are generally filled up by œdema of the cellular texture. As the disease proceeds, matter forms in the joint, and is often attended with great pain and fever; or the pus is effused into the bursæ, into the surrounding cellular tissue, or into the filamentous tissue amongst the tendinous sheaths of the muscles in the neighbourhood; being allowed to remain without an outlet, it at length communicates with the cavity of the joint. Portions of the cartilages are absorbed, though this, as already noticed, may occur at the very commencement of the disease; the subjacent bone becomes affected by ulceration, or perhaps its vitality is partially destroyed. When matter has accumulated, a portion of the capsular ligament generally ulcerates, the pus escapes, and is ultimately discharged externally.

When the disease begins with swelling, which is of a chronic character, and produces but little inconvenience, and when the more urgent symptoms supervene after the swelling has continued for a considerable time, there is every reason to suppose that the disease has originated in the synovial membrane, or perhaps in the osseous cancelli, and this is generally met with in poorly fed and strumous subjects. But when the first symptoms have been pain and stiffness of the joint, without change of its appearance, and when the swelling has occurred after these symptoms have been of some duration, then it is probable that the cartilages are the primary seat of mischief. For the most part, however, the symptoms have a general resemblance in most chronic affections of the joints, and all the apparatus is sooner or later involved. When the cartilage has been extensively absorbed, a grating sensation is felt in moving the articular surfaces of the bones upon each other. In consequence, also, of the softening and disorganisation of the lateral and other ligaments, the affected articulation at length becomes unnaturally loose, which is owing in some measure, also, to the muscles being wasted and paralysed from pain and disuse. At an earlier stage of the disease, the joint may be rigid from deposition of lymph into the contiguous cellular tissue, and contraction of the muscles.

Purulent matter not unfrequently collects in the substance of the bones, which in all cases ultimately become softened in a remarkable manner. In many subjects, without actual disease of the osseous tissue, the heads of the bones are so altered in consistence, are so deficient of earthy matter, as to be easily cut with a knife. It has been a matter of dispute, whether, in this affection, the articulating extremities of the bones are enlarged or not; and the supposition that they are always more or less increased in size, or hypertrophied, has arisen from the extensive effusion and indurated state of the soft parts being mistaken for this enlargement. In the first stages of the disease, they are seldom, if ever, enlarged; but when ulceration of the bone has occurred, new osseous matter is deposited to a greater or less degree in the neighbourhood of the ulcer,—an attempt by nature towards a cure, but too often an ineffectual one. The bones, in strumous subjects, are often much enlarged, from collection of purulent matter in their substance giving rise to a sort of spina ventosa. I removed the upper extremity of a boy lately on account of extensive disease about the elbow. The ulna to near the wrist was swollen enormously by purulent collections in its medullary canal. In cases when the whole of the articulating extremity of the bone is not enlarged, still that portion which is more immediately concerned in the articulation is often considerably expanded.

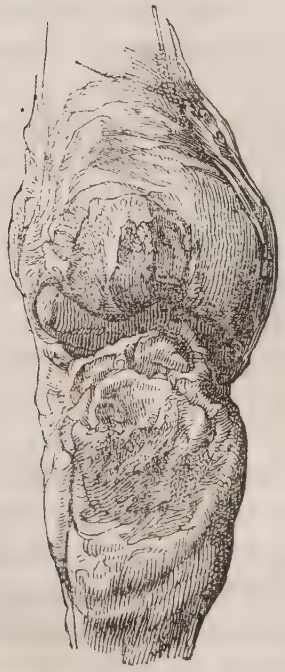
Frequently when the knee is the seat of the disease, the lymphatic glands in the groin are enlarged; and when the elbow or wrist joints are affected, there is often a similar enlargement of the glands in the axilla: such glandular tumours have not rarely been confounded with those accompanying malignant disease, and measures which were absolutely necessary for the salvation of the patient, have thus been delayed or neglected.

When the disease is extensive, and has endured for a considerable period, hectic fever supervenes, and is aggravated after the abscesses give way. The patient becomes much weakened and emaciated, and loses his appetite; the pulse is rapid, with night sweats, diarrhœa, &c.; and from a continuation of the hectic cause, the life is endangered. In some cases, however, the health is restored, and the disease abates spontaneously; in others, the disease is arrested, and a complete cure accomplished, by the careful employment of such means as will be afterwards mentioned.

The appearances produced by inflammation and consequent disease of the synovial membrane, are the following. In the first stage, the internal surface of the capsular ligament, and the rest of the synovial membrane, is found of a red hue, its formerly colourless vessels being now made apparent, from enlargement and consequent injection with a greater quantity of red blood; and the serum within the cavity of the joint is more abundant than in the natural state. When the disease has been of longer continuance, the membrane is found considerably thickened, its usual smooth glossy surface is destroyed, it is irregularly flocculent, and frequently of a light yellow colour.

The interarticular adipose tissue also seems to be increased in volume, from being infiltrated with a serous fluid, by the discharge of which the diseased bloodvessels may have attempted to relieve themselves. When the inflammation has been intense, or of long duration, lymph is secreted, and deposited on the external surface of the membrane, forming an intimate union between it and the ligaments, and producing thickening of the external apparatus. Or the lymph is also effused on the inner surface of the membrane, to which it adheres and becomes organised; this is generally accompanied by the formation of purulent matter; the organised effusion is often so extensive as to conceal almost the whole of the synovial membrane, excepting portions of its delicate reflexions which invest the articulating cartilages. By the lymphatic deposit, to a less degree, the folds also of the synovial membrane adhere to each other, whereby the motion is still farther impeded, and the pain, when attempted, increased. Occasionally the synovial membrane is found enormously thickened, much softened in texture, and of a brown hue, when the disease has been of a very chronic character. Along with these appearances, serum is generally found effused, in a greater or less quantity, into the cellular tissue exterior to the ligamentous covering. In cases in which the matter has formed and remained long within the cavity of the articulation, the synovial membrane and the ligaments become blended into one soft mass, the internal surface of which is lined with a thick coating of lymph, as in the case of common abscess. If purulent matter is effused externally, and communicate with the joint, the capsular ligament will be found to have ulcerated and given way at certain points, forming apertures, usually of small size, and with ragged margins.

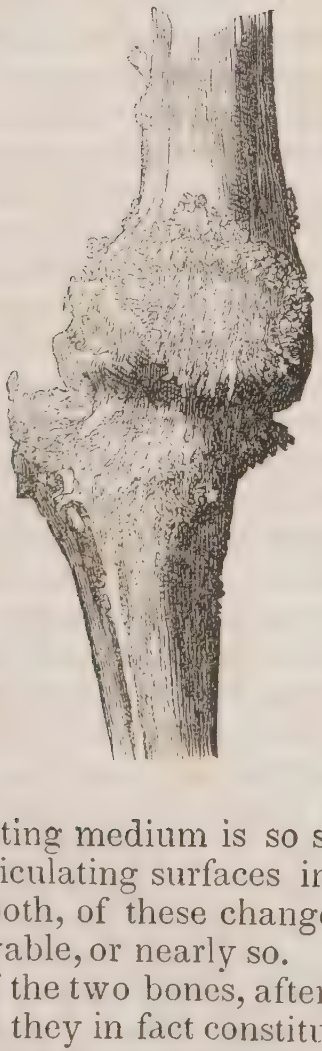
All these appearances may exist without disease of the cartilages or extremities of the bones; but generally they are also affected at the same time. At first the surface of the cartilage is slighty irregular and rough, and the change is not observed, unless on minute inspection. Afterwards the surface is marked with small depressions, which may be numerous, and are surrounded with irregular and somewhat serrated margins. They gradually increase in depth and extent, and the subjacent bone is ultimately exposed at one or more points, as here shown. Often the greater part of the cartilage is removed by absorption; the bone is exposed, opened out in its texture, softened, of an irregular surface, and in some places excavated, containing a thin ichorous fluid; the process of ulceration has also extended to the osseous tissue. Sometimes scales of cartilage of considerable size are either completely detached, having become dead, and been

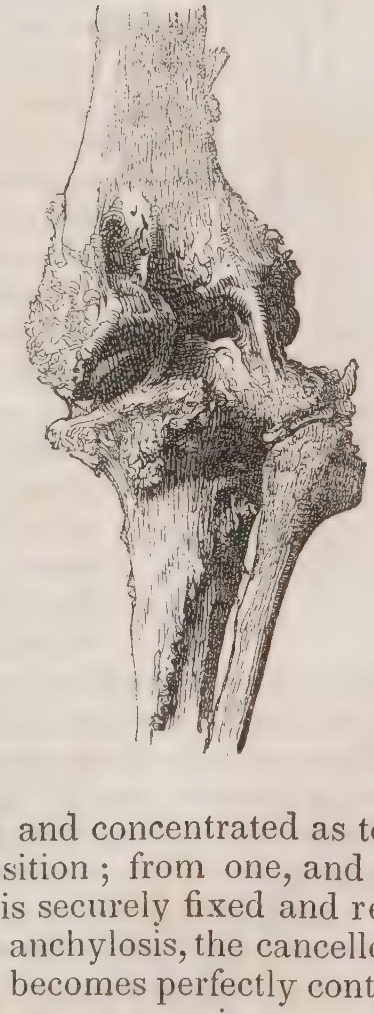


thrown off by the natural process, and are found lying loose in the cavity of the articulation; or they are all but separated, adhering by one or more very slender attachments.

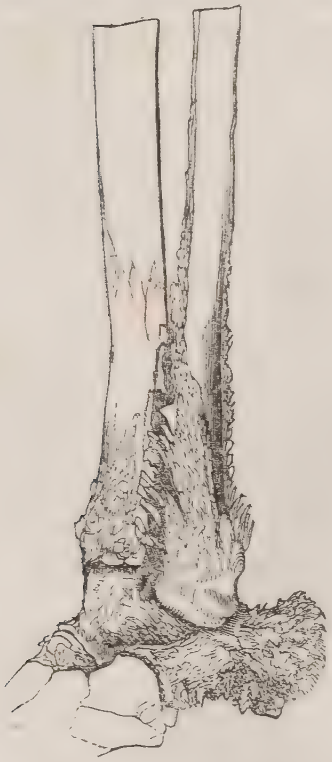
The incipient stage of such disease may exist without the synovial membrane being much, if at all, affected; but when the ulceration has made farther progress, all the articulating apparatus is more or less diseased. It may be here remarked, that the synovial membrane may be affected for a long period, thickened portions may extend over the cartilages, and these may have lymph upon them and yet remain intact.

The cure, resorted to by nature, and in which she may be much assisted by the surgeon, is Anchylosis, ligamentous or osseous. New bone is deposited in the neighbourhood of the disease, and the ulcers become, as it were, cicatrised; the articulating extremities of the bones are joined to each other by a firm osseous matter, either universally disposed or consisting of processes extended between the bones at various points: or again, in consequence of the effusion of lymph into the cellular tissue, and the consequent thickening and induration of that and of the fibrous tissue exterior to the joint, this connecting medium is so strengthened and concentrated as to retain the articulating surfaces in exact apposition; from one, and usually from both, of these changes, the joint is securely fixed and rendered immovable, or nearly so. In complete anchylosis, the cancellous texture of the two bones, after some time, becomes perfectly continuous, so that they in fact constitute but one bone, as seen in cut, p. 84. A very perfect specimen of anchylosed knee joint is also delineated in the cut above. But even after this happens, the disease is still apt to recur from slight causes, the bony or ligamentous union being





disturbed or destroyed, and the original disease attacking the parts with fresh activity; abscesses form,—may be extensive both in size and number,—and thereby the health is again undermined. So that the patient, after undergoing much suffering and risk, preserves, perhaps only for a few years, a limb which is almost useless to him, and which must be removed at last. In other cases, the union is permanent, the disease does not return; by care and time the limb is brought into the most convenient position, and proves of considerable service.



The joints are often affected by rheumatic and gouty inflammation; and there are three species of disease, tolerably distinct in their pathological characters, generally attributed to these causes. In one there is a deposit of chalky-looking matter, composed chiefly of super-lithate of soda, on the articular surfaces of the synovial membrane and cartilage, but most abundantly in the cellular tissue outside the joint, an affection in which the cartilage is seldom known to ulcerate. In the second, the cartilages are atrophied, as if worn away by attrition, the articular surfaces of the bone being much modified in shape, more or less denuded of cartilage, and remarkably polished and hard, so as to have been compared to porcelain, as will be described in another section. In the third, the fibrous tissue in the neighbourhood of a joint is primarily affected, the synovial membrane and cartilages not becoming involved till the disease is much advanced. It is not uncommon in the elbow of middle-aged persons who have been much exposed to the atmospherical vicissitudes, and is sometimes attributed to the effect of mercury or syphilis. The periosteum around the articular ends of the bones becomes swelled and painful; the affection is very slow in its progress; abundant deposition of adventitious bone takes place, often in short spiculæ, gradually encroaching around the joint, which ultimately becomes involved. A good specimen is here given. The disease was of twelve months' duration, and was attributable to rheumatic inflammation supervening upon sprain. The affection involves extensively all the bones composing the articulation.

Although wounds penetrating the larger joints are attended with danger, the synovial membranes are possessed of considerable powers of reparation, and often heal readily after severe injuries. An occasional result of inflammation is adhesion between the layers of the membrane, but this is by no means so frequent as in the serous tissues. The reparative power of cartilage is so low that the best termination that can be expected from the ordinary forms of ulceration, is union between the abraded surfaces. In experiments which have been made on the lower animals, portions of cartilage which had been removed from their joints were never reproduced, but the functions of the part were soon restored by the cut surface becoming smooth. In like manner there is occasionally to be seen in museums a circumscribed indentation in human articular cartilage, as if it had been destroyed by a small ulcer in this situation, which had cicatrized without any reproduction of the destroyed tissue.

ON HYPERTROPHY AND ATROPHY OF THE ARTICULAR CARTILAGES, WITH EBURNATION OF THE SURFACES OF THE BONES.

It has been already observed (at page 68), that the cartilages are occasionally swelled and softened in cases of chronic inflammation; and it now remains to notice instances in which they become hypertrophied or atrophied, apparently without inflammatory action. Although these affections are not likely to come often under the treatment of the surgeon in civil life, yet they are of much importance to the naval or military practitioner, since an accurate knowledge of them will lead him to institute a careful inquiry when a man complains of inability to sustain the fatigue of marching with the burden of a heavy knapsack; and they are of considerable interest in a physiological point of view, because they tend to show the inherent vitality of cartilage, and that it is liable to serious organic changes quite independently of diseased action in the surrounding tissues.

Some examples of hypertrophy of cartilage, principally affecting that of the patella, have been described by Mr. Gulliver, and figured in the third fasciculus of drawings from the Army Anatomical Museum. In these the cartilage is swelled so as to form a ridge across the articular surface of the bone, the hypertrophied part being perfectly smooth, except where its continuity is interrupted by irregular fissures, as if the perpendicular cartilaginous fibres were split into bundles of variable size and shape. These cases occurred in young and middle-aged men who died of pulmonary consumption; and it is probable that the disease would be more frequently found, if it were more frequently looked for, since it does not seem to have been accompanied by any change in the surrounding parts, and would perhaps only be indicated by weakness of a joint rendering it unfit for severe work.

The atrophy, or absorption of cartilage, is so frequently seen in the joints of old subjects, that some authors have been disposed to regard it rather as a physiological than a pathological condition. It is, however, unquestionably a disease; and in the drawings above mentioned, are some specimens of it from a soldier under the middle age. The cartilage seems in the first instance to be opened out in its texture, and numerous little villous processes appear on its surface, often as if its fibres were enlarged after absorption of the substance which connected them. The thinning sometimes takes place in patches, occasionally in grooves, corresponding to the motions of the articular surfaces; the subjacent bone becomes at length completely denuded, and soon presents a polished porcelain-like surface, which is so remarkable that it is commonly known under the name of porcellaneous deposit. It is obvious that, when the disease has proceeded thus far, the joint must become more or less deformed, and its motions considerably impeded. Accordingly, old men are often seen at work with much rigidity of the joints, particularly of the knee, which is frequently projected inwards, from absorption of the cartilage from the outer condyle of the femur and corresponding part of the tibia, with a thinning and degeneration of the inner-articular cartilage into a tissue resembling the cellular.

The hard, polished, and ivory-like appearance of the articular surface, would lead us to suppose that it contained an unusual quantity of earthy matter, yet an analysis by Dr. Davy, here given, shows the contrary.

Composition of the Shaft.		*Composition of the polished Articular Surface.*	
Phosphate of lime, &c.	58·8	Phosphate of lime -	54·2
Animal matter -	41·2	Animal matter -	45·8
	100·0		100·0

In many instances where the disease is of long standing, a deposit of adventitious bone takes place around the articular surfaces, and this may occur to such an extent as to produce anchylosis of the joint, the articular extremities of the bone often presenting several irregular depressions, and becoming variously altered in shapes, as shown in the cuts, p. 86.

It is curious that the atrophy of cartilage is generally seen in its early stage to attack the joints in pairs, and to occur also in corresponding parts of the articular surfaces: a fact which coincides with the disposition of caries to appear simultaneously or successively in corresponding molar teeth.

Of the causes of the disease but little is known, although it is generally attributed, like some other obscure affections, to the effect of rheumatism. It often follows in old people upon long disuse and confinement of a limb to one position, as during the cure of fractures. A very valuable specimen was presented to me lately by my friend Mr. Busk, of the Dreadnought hospital ship. The elbow had been apparently subjected to great injury. The radius and ulna had been fractured: the former had united, whilst a false joint had been formed betwixt the portions of the ulna. There is profuse deposit of bone around the elbow-joint, which must have been quite stiff, or nearly so, as regarded flexion and extension; but the end of the radius and corresponding articulation of the humerus are beautifully polished. This polish is not unfrequently seen also upon disunited fractures, as in the neck of the femur. Atrophy of the cartilages has been seen where no rheumatism was ever known to have troubled the patients; and they are more generally disposed to ascribe it to the effect of incessant hard work. At all events it is comparatively rare among women, and in the upper ranks of society; and the wasting often presents very much the appearance which would result from the effects of attrition, as if the wear of the cartilage had not been supplied by a corresponding reproduction. It is probable, therefore, that the affection is attributable to defective nutrition, somewhat allied to certain changes in the cornea, which are known to proceed from this cause, and which are also unattended by inflammation or the formation of pus.

The symptoms of the disease are generally obvious enough in the more advanced stages by the crackling which may be heard when the joint is moved; and in the early stage a grating may be felt by a careful manipulation.

SCROFULOUS DISEASE OF JOINTS.

Affections of the membranes, ligaments, and bones, often occur in persons of weak constitutions, and proceed very gradually. They have been all classed under the general term of white swelling. They most frequently present themselves without any assignable cause, or are attributed to the slightest injuries. The disease generally commences in the cancellated texture of the bones: these are soft and light, and contain in their cells a quantity of caseous or tubercular matter. The softness is attributable to an interstitial atrophy of the bony tissue, as well as to an alteration in the proportion of its constituents; the animal matter being in excess, with a corresponding deficiency of the phosphate of lime. There is an increased vascularity of the medullary membrane, and the cancellated texture contains thin brownish-looking fluid instead of marrow. In cases of disease which has commenced in the cancellated texture, there is hardly any pain at first, and the progress of the disease is remarkably insidious. When the lower extremity is affected, the child is observed to limp; the limb wastes; it appears to be longer, partly from atrophy of the muscles, partly from relaxation of the ligaments and effusion into the joint.

The term white-swelling, which ought to be discarded from surgery, was at one time made to include all the different affections to which joints are liable in weak constitutions — thickening of the parts, with an external colourless swelling — collections of matter about articulations, with or without an external aperture — effusion of fluids into the cavities of joints, or into the bursæ — destruction of cartilage by ulceration, or in consequence of portions becoming dead — absorption, ulceration, caries, or intractable ulceration of the bone adjoining the articulation.

Those under twenty years of age are most liable to chronic affections of the joints, and they occur very frequently in children. Great anxiety is often shown by friends of patients to account for chronic disease of a joint, so as to save their whole generation from the imputation of being tainted with scrofula. It is attributed, sometimes correctly enough, to some injury perhaps trifling; to a sprain, or twist, or squeeze from a tight shoe, or to a bruise from falling; and it is no doubt true, that young or old people of the most healthy constitutions, if thrown out of health from one cause, will present all the appearances of scrofula, and become affected with chronic diseases of the mucous membranes, glands, joints, or bones, from very slight existing causes.

Such affections advance slowly; all the articulations are liable to them; but those which are most subject to the disease are the hip, knee, ankle, and elbow. Of these, the knee-joint is most frequently affected, probably from the greater extent of cancellated and articulating surface. In young persons of unhealthy constitutions, the joints not unfrequently become affected one after another, and superficial abscesses form, terminating in open sores. I was obliged to amputate the upper extremity of a young lady a few days ago, in which a metacarpal bone and its articulation, the entire chain of carpal bones, the wrist and elbow joints, were all thoroughly involved in disease.

NEURALGIC AFFECTIONS OF JOINTS.

The joints, like other parts of the body, are very often the seat of painful affections, without organic disease existing. These neuralgic affections are often connected with, or followed by, hysterical symptoms. They frequently also depend upon derangement of the digestive organs,—upon the lodgement of irritating matters, sordes, or worms in the intestinal tube; and when we reflect upon the extent of the lining membrane, the expansion of nervous filaments, and upon the sympathy which they hold with the whole system, we cannot be astonished at the circumstance. Many cases of supposed hip-disease in children, with the symptoms and some of the signs of it, have come under my notice, which have yielded at once to the expulsion of offending matters or worms. Some affections of joints seem to depend upon gouty diathesis; others are intermittent: at one time the joint complained of is hot, and somewhat swollen; at another cold, and bluish on the surface. In these affections of joints the pain, indeed, is seldom constant: the patient's rest is not broken; there are none of the violent spasms during sleep, which attend upon certain alterations of structure. The pain is equally complained of when the part is touched with the utmost gentleness, or when a thorough and searching examination is made, when the joint is freely moved, and the articulating surfaces of the bones are forcibly squeezed against each other. The pinching of the skin causes pain. There is seldom throbbing, or heat, or swelling; though, after long continuance of the diseased state, these may supervene to a slight extent. The pain complained of is seldom referred to one point, but to a large extent of the limb; and if the attention is diverted, the examination may be carried to any extent, without complaint being made.

Sir B. Brodie, who has done a great service to the profession by directing attention to these nervous affections in his excellent work, and in his lectures, notices that the knee, when the seat of pain, is generally kept in the extended position, and this is very different from what has been stated to be the position of one affected by organic disease. The tumefaction following upon local treatment, and especially when leeching and counter-irritants have been employed, is sometimes, as he remarks, very perplexing.

This class of diseases generally affects females of delicate organisation about the age of puberty, and in whom the menstruation is irregular. Males in delicate health are also subject to similar affections.

ON GROWTHS FROM THE SYNOVIAL MEMBRANE, AND LOOSE SUBSTANCES IN THE JOINTS.

The synovial membrane is sometimes studded on its inner aspect with loose fleshy or semicartilaginous substances projecting into the cavity of the joint. The entire surface of the membrane is occasionally covered with these bodies, which are of a white or yellowish colour, and very variable in size and shape; the smallest presenting the form of villi not much larger than those of the jejunum, the largest having somewhat the magnitude and appearance of the appendices epiploicæ of the large intestine, while many of an intermediate size approach in appearance to a lemon-seed. In some instances the membrane is only partially pervaded by them, and they are not unfrequently arranged like a fringe around the edge of the articular surfaces. They are generally very smooth on the surface, which appears to be perfectly continuous, if not identical, with the synovial membrane. Their attachment is frequently broad, and occasionally very narrow and pedunculated, often merely filamentous, so that a little further thinning of the part, or slight force acting on the body, would remove it from the capsule, and throw it loose into the cavity of the articulation. The disease has been most frequently seen in the knee, and sometimes in the elbow.

The affection is obscure in its nature; it is slow in its progress; the joint is the seat of pain after and during exercise, probably from the morbid processes interfering with the motions of the articular surfaces. As the disease advances, the joint becomes swelled and elastic, unattended generally by ulceration of the tissues within or around it. In examining the part, when the articular surfaces are moved on each other, it will be found that their motion is more or less interfered with; and considerable irregularity in their action may be felt by the hand placed firmly on the joint during the procedure.

Loose bodies may be found in the articulations, particularly in the knee and elbow, under the circumstances just described; but we often find others of a different structure loose within the capsule, which may be throughout smooth and apparently healthy. These bodies are extremely variable in size, generally rounded or oval, with a polished surface; many of the smallest present the character of fibro-cartilage or cartilage; the larger are often more or less modulated, very firm and gristly, and sometimes contain a considerable nucleus of bony matter. The articular ends of the bones are occasionally more or less misshapen by the formation around them of knobs of adventitious osseous substance.

The disease is common in the knee; and patients frequently go about for years, who will tell you that they have something rolling within the joint, which will often be found on examination to be actually the case. It is obvious that loose bodies in the joint must prove an obstacle to easy progression; and the smaller ones seem to be particularly so, probably from becoming easily entangled by different parts of the articular apparatus.

However difficult it may be to account for the cause of these formations, the means by which they may get within the articulation seems obvious enough. If a small knob of coagulated lymph should form on the inner aspect of the membrane, the point of attachment, as has already been noticed, might gradually become narrower, from the motions of the joint or other causes, till the connection were severed. But there is reason to believe that many of the substances found loose in the joints are formed altogether in the cellular tissue without the capsule; for it is difficult to conceive that they can increase in size, or take on the ossific action in their centre, by an act of independent vitality, after they have been separated from the surrounding parts. Accordingly, dissection has occasionally disclosed loose bodies within the knee-joint, and others of just the same structure outside the synovial membrane, which was however protruded by their pressure, and appeared to connect some of them by a pedicle only, ready to break and allow the foreign body, with its covering of the membrane, to fall into the cavity of the articulation.

AFFECTIONS OF SYNOVIAL POUCHES OR BURSÆ.

Bursæ are lined by a membrane, greatly resembling the synovial in appearance, function, and disease. They are frequently the seat of inflammation of an acute character; but in most instances the action is of short duration, and generally terminates in an increase and accumulation of the secreted fluid. The attendant pain is very severe, and much increased by any motion of the neighbouring parts.

Occasionally a portion of the cellular substance, which is exposed to pressure of motion, as over a prominent portion of bone, assumes the appearance of a bursa, secretes a similar fluid, and is similarly affected in consequence of inflammation. These adventitious bursæ are met with in various situations. Bunion is a good example of such a bursa thickened from long-continued pressure. They are seen on the outer ankles of tailors, on the shins of boot-closers, on the forehead, point of the elbow, &c.

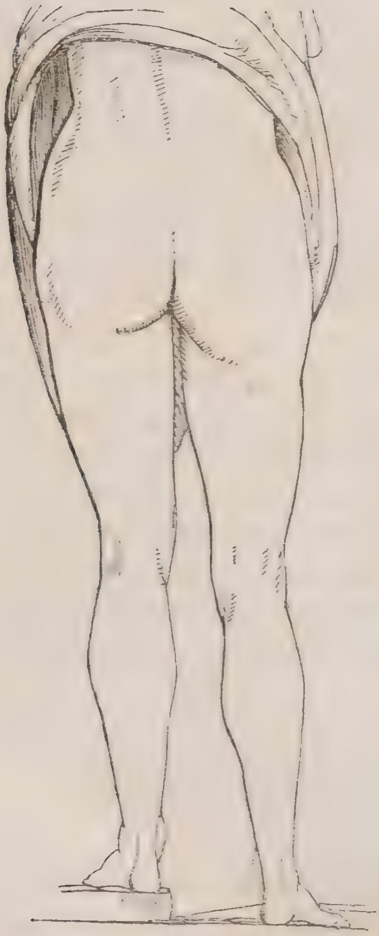
Disease of the bursæ may occur from external injury, and they often become affected subsequently to disease of the neighbouring joint. If the action is violent, lymph is effused on the inner surface, or external to its cavity, causing considerable thickening. The sac is thus sometimes all but obliterated. Tumours, originally housemaid's knee, aggravated by continued pressure, are met with over the ligament of the patella in almost a solid state. Occasionally the action terminates in suppuration, pus being effused to a greater or less extent into the cavity ; and if allowed to remain or accumulate, the abscess extends, and frequently communicates with the neighbouring joint, which may not have been previously diseased. In chronic cases of enlarged bursæ, especially of the bursal thecæ of the tendons of the wrist or ankle, we not unfrequently meet with loose cartilaginous bodies of various sizes, and of a flattened oval form, floating in the accumulated fluid. These have been also supposed to be formed by portions of lymph which have been deposited on the surface, condensed in structure, and afterwards become detached.

When inflammatory action has commenced in a bursa, it must be subdued by copious topical bleeding, along with the exhibition of purgatives; in most cases general bloodletting will not be required. After the inflammation has subsided, the parts remain swollen, from the effusion either of serum or lymph; stimulating applications may then be employed with advantage. In general, the ammoniacal plaster, or the brushing over the surface with tincture of iodine will answer. Blisters are sometimes employed with the same view. In obstinate cases, when the tumour is of no large size, a seton may be passed, retained till suppuration has taken place, and gradually withdrawn. Great risk attends interference with bursæ of large size near joints or cysts containing serous or glairy fluid in any situation. Even trifling punctures into such have been sometimes followed by inflammation of the inner secreting surface and violent constitutional disturbance. When suppuration has occurred, it will in many instances be prudent to evacuate the matter by one or more incisions, in order to prevent farther mischief, especially if the bursa, a superficial one, is in the neighbourhood of a joint. After the matter has been evacuated, the cavity gradually contracts, and ultimately the bursa is completely obliterated. Diseased bursæ, near the surface, and unconnected with important parts, have been dissected out. The operation is not often necessary, and in some situations attended with considerable risk. Tumours, solid or nearly so, arising from diseased bursa of long standing, may sometimes require to be so treated.

OF COXALGIA, MORBUS COXARIUS, OR HIP-JOINT DISEASE.

This disease has been supposed to commence in the cartilages; it appears, however, to originate indiscriminately in the cartilage and the bone, as well as in the membrane lining the capsule and investing the cartilage and the ligaments; but whether it begins in one or other of these tissues, it soon, if neglected, involves them all. It affects patients of all ages, though children under twelve are most generally its victims ; and in these it often makes considerable progress without its existence being suspected. The patient is observed to be a little lame, and to be awkward in the use of the affected limb, but he experiences little or no pain in the first instance; and if he does, it is of a dull kind, and generally referred to other parts. Thus, pain in the knee is generally the prominent symptom of this affection, and occasionally pain is also referred to the ankle, or to the sole of the foot: careful study and considerable experience are here required, to guard the young practitioner from error in diagnosis. Parts remote from the seat of morbid action have often been made the subject of treatment in this and other affections; the knee, in morbus coxarius, has been leeched, poulticed, blistered, and burnt, and that, too, when this joint was not at all altered in appearance, and showed no symptom of disease.

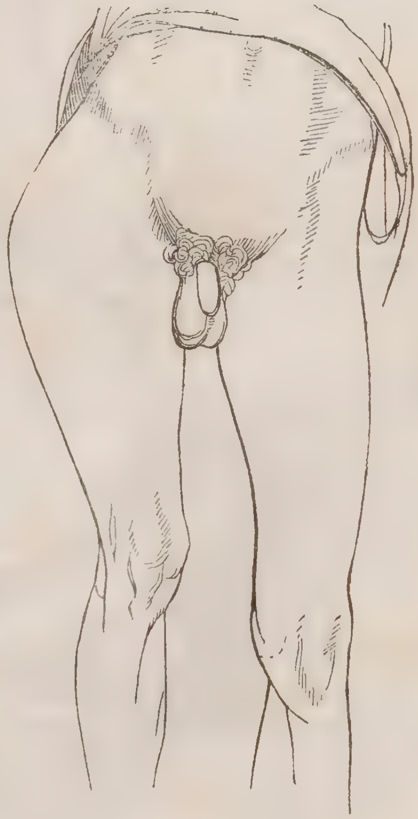
Again, and particularly in adults, the limb is easy only in certain positions, and cannot be moved without great suffering; pain is also complained of in the groin, and often immediately behind the trochanter major. If an examination is made when the patient is thus halting, and even though he complains of no pain, the limb is found shrunk, wasted, and lengthened. The elongation of the limb occurs mainly in consequence of the inclination of the pelvis towards that side. When the disease has made progress, it has been supposed that swelling of the apparatus of the joint, and effusion into its cavity, might separate the head of the bone from the acetabulum, when pressure from the trunk was not applied. The lengthening is often great, and its extent and cause are ascertained by accurate comparison of the two limbs, laid in contact when the patient is in the recumbent posture.



The degree of lengthening is here carefully represented from a recent case. But occasionally, even in the first stage, before destructive ulceration has set in, in consequence of the pain and spasms, the limb becomes remarkably shortened and retracted. This also will be found, on careful examination, to depend upon the relative positions of the two ossa innominata.

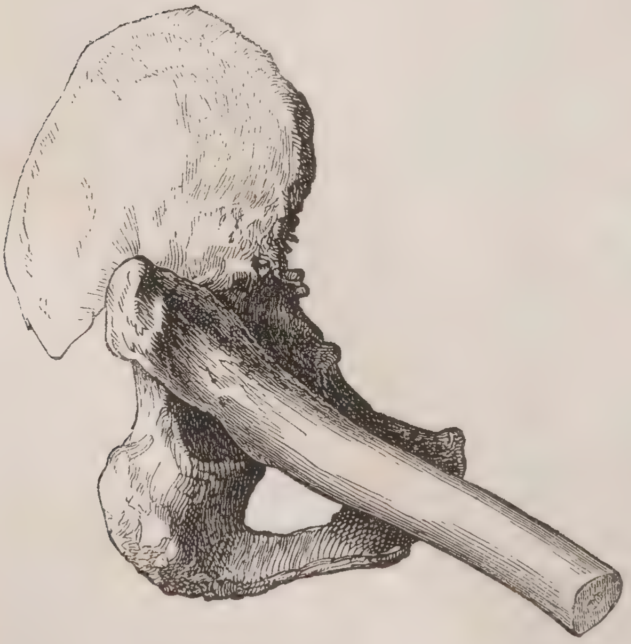
When the patient stands, the affected limb is considerably advanced before the other, on which the weight of the trunk is chiefly, or entirely, supported; the knee is generally bent, and the toes only rest on the ground. In the advanced stages of the disease, and when there is reason to suppose that ulceration of the cartilages has set in, the patient, during progression, moves the affected limb with the hands grasped round the thigh, and in bed it is moved by the aid of the sound one. The spine is frequently affected, becoming bent in different directions, to preserve the equilibrium of the body; and a deformity of the trunk to a certain degree occurs, which, however, may be in general easily remedied. The nates are much altered; they become flattened, and those parts which are naturally most prominent are reduced to the level of the others; the usual niche between the buttock and thigh, in the erect position, is effaced, and the upper part of the thigh is often considerably swollen. The alteration is at once manifest on contrasting the healthy with the diseased side. Even from the first, locomotion is difficult: in the morning, the movements of the joint are constrained and stiff; afterwards, however, the patient walks with more ease, though still by very slight exertion the limb is speedily tired, and he is unwilling to use it. Pain is produced by pressing on the groin, or by tapping on the trochanter, and by pushing the head of the femur forcibly against the acetabulum. The inguinal glands occasionally become enlarged. As the disease advances, the lameness is more apparent; pain is produced and increased by motion, and by any attempt to stretch, and more especially to abduct the limb whilst in the recumbent posture. The emaciation of the member becomes more and more visible. The muscles, as it were, are paralysed from inaction and pain, abscesses form, and the constitution then sympathises remarkably; hectic fever supervenes, with its usual train of symptoms.

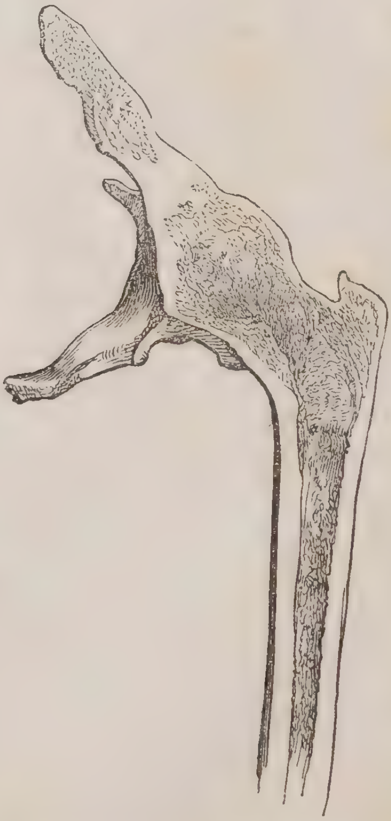
The circumstances attending the first stage of the disease in childhood, in which the limb is lengthened, and there is no decrease, but rather an enlargement of the parts composing the joint, have been already described and illustrated. When, however, absorption occurs, and the articulation begins to be destroyed, the second stage of the disease commences, and the limb becomes then sensibly shortened; the toes are turned inwards or outwards; in many cases there is every appearance of dislocation of the thigh upward and backward; and in others the limb is much bent, the toes only reaching the ground. The ultimate position of the limb and degree of shortening will depend much upon the extent to which the head and neck of the femur is destroyed, upon the inclination of the pelvis, and also upon the portion of the acetabulum which is most diseased. The joint becomes tender, the slightest motion causing much pain, and the parts around appear swollen. The patient retains the limb in the most comfortable position, and it is generally bent upon the pelvis and inverted. This may arise from relief being afforded when the psoas is relaxed, and the pressure thus removed from the fore part of the joint. In many cases matter forms behind, or rather below, the trochanter major, and the collection often attains a large size. When the presence of matter has been ascertained in this situation, it has been



recommended that an early opening should be made, on the supposition that the disease arises from an acrimonious discharge into and round the joint, and that, by the matter being allowed to escape, the cause of the disease may be removed. The synovia has been compared by one old author to bland oil, the vitiated secretion to oil of vitriol. Though the principle is incorrect, still the rule of practice is important; for in consequence of the long-continued presence of matter, accumulating in a cavity which is not dilatable in proportion to the increase of purulent secretion, the original affection will be much aggravated, and disease induced in the neighbouring parts. But the existence of matter in the joint could only be ascertained to exist in a very emaciated person.

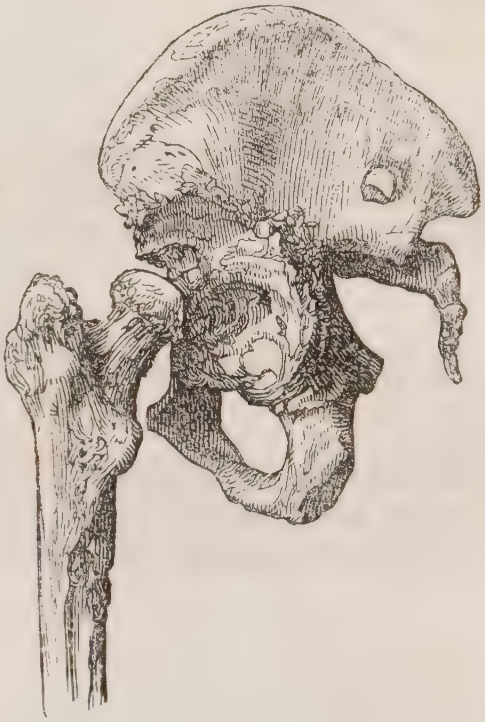
The formation of matter is preceded by great pain, and frequent startings of the limb during sleep, accompanied with fever, and other symptoms of severe constitutional disturbance. On the escape of matter by the natural process from the capsule the painful feelings usually subside. The abscess may appear, as already stated, near the trochanter major, or in the back part of the thigh. Matter sometimes makes its way into the pelvis, through a perforation in the acetabulum, thence it may fall through the sacro-ischiatic notch into the thigh, and find its way under the fascia, nearly to the knee; or again, it may present to the side of the rectum, or even, as I have seen, burst into the bowel and continue to be discharged thus for a long period. If the treatment is neglected, abscess succeeds abscess; and in consequence of the profuse discharge, which may be evacuated from one or many openings round the joint, the patient is at length exhausted, and sinks. In some instances the spontaneous cure by anchylosis occurs, as in the instances from which these





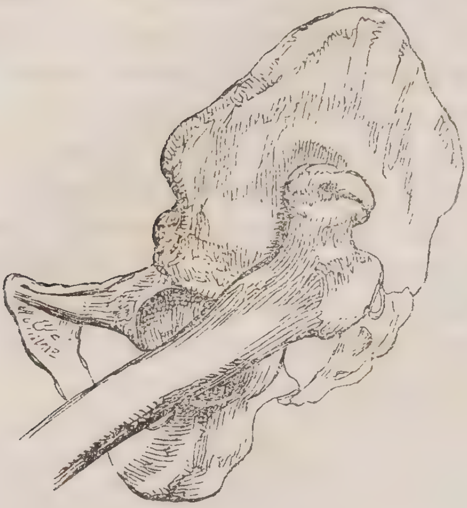
sketches are taken. In the one, the head and neck of the bone had been almost entirely destroyed by ulceration, before anchylosis had begun; in the other, the change is very slight, but the head of the femur and os innominatum are inseparably united by bone, and their cancellated texture runs into each other. Or when the femur has been dislocated, which is a very rare occurrence, the disease sometimes gradually abates, and a sort of new joint is formed; the limb, after some time, may thus again become so far useful to the patient.

In many cases, the appearance which the various parts of the diseased joint present, are similar to those which have been already described when treating of affections of the joints generally. Frequently, however, the osseous tissue in this situation is much more extensively affected. Often the whole cartilage on the head of the femur is completely removed, exposing the bone in an ulcerated condition; and when the system has long borne up under the disease, the greater portion of the head, neck, and even of the trochanter, is destroyed, the extremity of the bone being completely altered in form, and composed of a loose and spongy structure. A similar disorganisation occurs in the acetabulum; the mucous gland is destroyed, the cartilage is often wholly removed, and the margins of the acetabulum absorbed, a large and flat ulcerated depression merely being left for the reception of the diseased femur; in other instances the margins remain unaffected, whilst the ulceration proceeds in the centre, and the cavity is thereby much deepened. Not unfrequently the ulceration proceeds farther, and an aperture is formed in the acetabulum, so that matter accumulates within the pelvis. The opening is sometimes so large that the femur is protruded through it. When matter has formed in the soft parts round the joint, portions of the bones of the pelvis, in contact with the pus, are ulcerated to a greater or less extent, and sometimes these ulcers are surrounded by deposits of new bony matter.



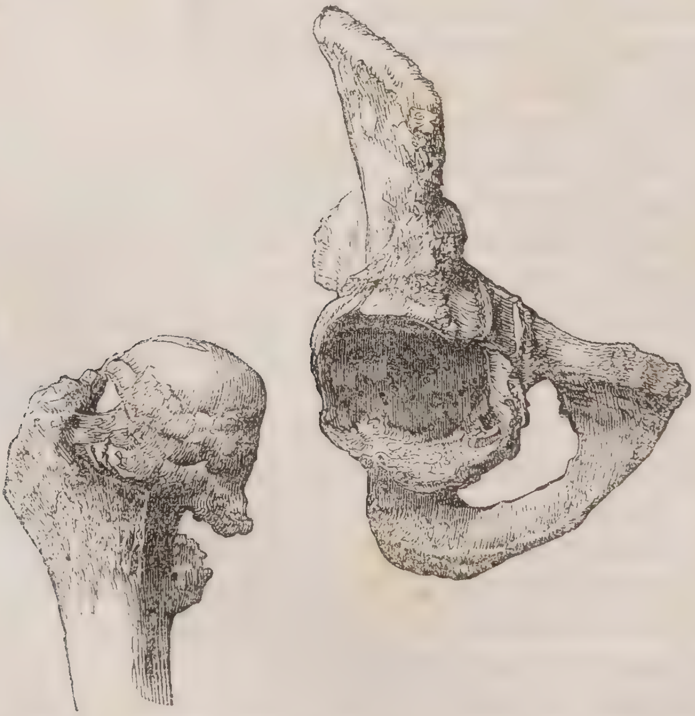
From such changes in the osseous parts of the articulation the limb is shortened, sometimes to a great degree, though no dislocation has occurred. Indeed, dislocation is by no means so frequent a cause of the shortening as is generally believed.

If the head of the femur has been dislocated, and if the disease in the joint has afterwards subsided, the acetabulum is found to be much contracted, with its margins smooth and little elevated, and, if the patient survive for a number of years, it will be almost wholly obliterated. But a portion of the dorsum of the ilium, upward and backward, which is the most frequent dislocation in this disease, is gradually absorbed, so as to form a sort of glenoid cavity for the reception of the femur, the extremity of which becomes more solid in texture, and more smooth on its articular surface. The remaining neck of the bone is in the sketch here given turned forwards, and must have given rise to great eversion of the toes. I have seen one other specimen of this form of luxation. The limb is generally, however, inverted; and what remains of the head of the bone consequently points backwards. The consecutive luxation occasionally, also, though rarely, takes place upon the pubis. Whilst a depression is thus formed, new bone is sometimes deposited round its margins, whereby the cavity is increased in depth, so as to resemble somewhat the original acetabulum, the new deposit having become smooth and of a regular form.

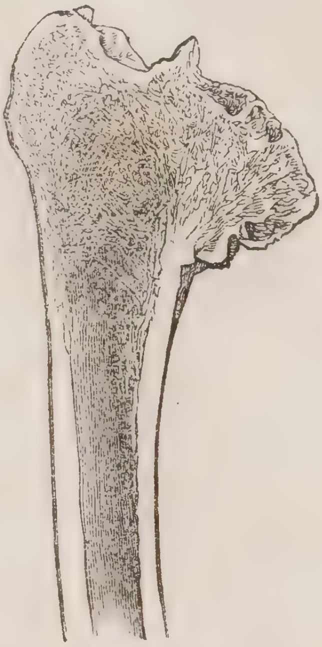


ON CERTAIN ALTERATIONS OF FORM IN THE HEAD AND NECK OF THE THIGH BONE.

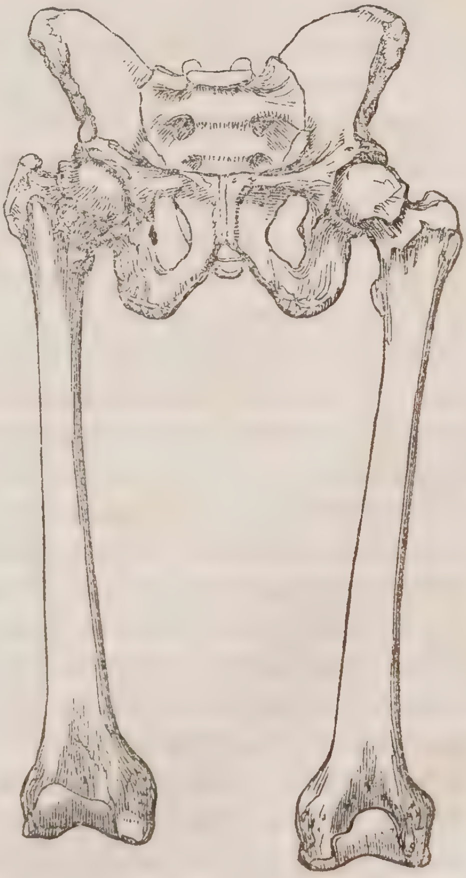
When treating of atrophy of the articular cartilages, it was observed that, in the latter stages of the disease, the subjacent bone was liable to become denuded, and its articular extremity more or less deformed.



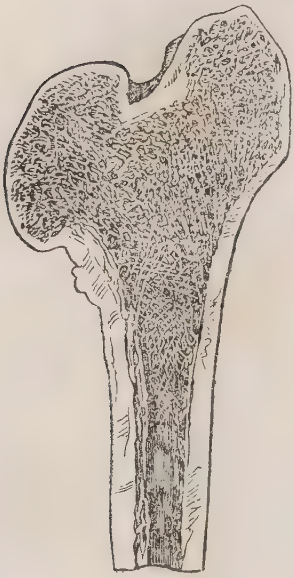
Now one of the most interesting of these changes occurs in the head of the thigh bone, which becomes polished on its surface, flattened and expanded, with a corresponding alteration in the acetabulum. In other cases the head of the thigh bone is somewhat elongated, and the acetabulum becomes deepened in proportion, by a deposition of new bone around its margin, as shown in the preceding page, frequently to such an extent as to render the removal of the head of the bone, even after the removal of all the soft parts by maceration, almost impossible without fracture of the edge of the socket. The head of the bone may also become still further misshapen, and anchylosis result; while in some instances the new bony matter presents in the form of nodosities, sometimes projecting towards the cavity of the articulation. This cut represents a section of the upper end of the femur of a labouring man, aged 49, who had fallen on the trochanter ten years before death, and became gradually lame in consequence, with shortening of the limb and anchylosis of the joint, although he had never been confined more than a day or two on account of the injury.



But there is another affection in which the femur may be shortened in a comparatively brief space of time from absorption of the intra-capsular portion of its neck, generally succeeding to a fall on the trochanter, and sometimes occurring in young and middle-aged subjects. In treating of fractures of the cervix femoris, it will be observed that retraction of the limb is occasionally delayed for a while: hence the importance of an accurate knowledge of those cases in which shortening of the neck of the thigh bone may succeed to an injury short of fracture. The deficiency of accurate anatomical details concerning such cases led to a doubt as to their existence; but this question has been completely put at rest since the history and dissection of two unequivocal examples by Mr. Gulliver; and the annexed cut represents the changes of form in the head of the bone, the shortening of the neck and comparative length of the femora, in a young man from whom these bones were obtained, and who walked about as many others have done, during the progress of the disease.



In the above, and in many other cases, the shortening of the neck of the bone is unaccompanied by any absorption of the articular cartilage of its head. A section of another well marked specimen may be here added. This bone also exhibits approximation of the head to the shaft, from absorption of the neck. The head is somewhat flattened and expanded, but the articular cartilage is entire, and of its natural thickness. The acetabalum was diminished in depth, but enlarged laterally, so as to correspond with the alteration of shape in the head of the thigh-bone. The preparation was obtained from a man at 32, who died at the General Hospital at Chatham of pulmonary consumption, after a confinement of two years in hospital. Previously to his admission, he had regularly performed his duty as a light infantry soldier, from which it is plain that his limbs were then of equal length, although, when the body was examined, the affected femur was upwards of one inch and a half shorter than the other. From a careful inquiry after his death, it appeared that he had, five years previously, fallen on the trochanter, in consequence of which he often complained of pain in the hip, but continued to do his duty long after, never having been confined on account of the accident. It therefore results, that morbid change had taken place during his long confinement in hospital, a circumstance not very favourable to the recommendation by some surgeons of the horizontal posture, as a remedy in such cases, and equally adverse to the opinion of certain continental pathologists, who inform us, that shortening of the neck of the femur is to be attributed to the gradual operation of the superincumbent weight of the body.



In old subjects, particularly in fat women, the neck of the femur is often shortened, and becomes more transverse and brittle than natural, from a true interstitial absorption or atrophy of the osseous tissue. This has sometimes been described as a natural effect of age, but it is undoubtedly disease, for in the greater number of old people the neck of the thigh-bone presents its usual length and obliquity. The affection is obviously a very serious one, as predisposing to fracture of the part, under circumstances which render its reunion almost hopeless.

Treatment of Affections of the Joints.—After the infliction of a wound, accidental or not, in order to prevent inflammation of a joint from becoming violent, it is of the utmost importance to bring the edges of the wound into close apposition. Sometimes neither local action, nor disturbance of the constitution, supervene on an opening, even of considerable size, being made into a joint, while the slightest puncture often gives rise to the most dreadful symptoms, both local and general. An incised wound, of no great extent, will be sufficiently closed by the careful application of adhesive plaster, and attention to the position of the limb; but if it is extensive stitches become indispensable. The parts must be kept in a state of complete relaxation and rest; cold cloths or iced water, allowed to drop or run over the surface by capillary attraction, should be assiduously applied. The patient's bowels must be freely opened, and he is to be kept on low diet. If inflammatory action occur, bleeding, locally and generally, must be had recourse to energetically, accompanied with warm fomentations to the parts; and, at the same time, preparations of antimony, and other saline medicines, are to be administered internally. If there be reason, from the symptoms, to suspect the formation of matter, the parts ought to be attentively examined, in order to detect its presence; and, when discovered to exist, it must be evacuated without delay. In chronic cases, even local bleeding to any great extent is inadmissible. In some a few leeches may be applied, followed by counter-irritation, with advantage. The employment of counter-irritation is, perhaps, chiefly to be trusted to in the treatment of those more chronic affections of the joints in which, from the painful feelings, there is reason to dread disease of cartilage or bone. Of these, blisters are most in use; though, from my own experience, I cannot much recommend them. Their constant repetition is exceedingly annoying, and the slow progress which is made towards a cure under their use is far from encouraging. Tartrate of antimony, applied in the form either of ointment or of plaster, is generally productive of much advantage, in the first instance, by causing a great degree of superficial irritation, and relieving the internal parts. After the pustules have been fully developed, its use is to be discontinued till the surface be nearly whole, when it is again to be resumed, if the recurrence of painful feelings should demand it. Caustic issues have been much praised, and are occasionally beneficial. An eschar is made by the caustic potass applied to the skin, or by rubbing the bichloride of mercury, or any other caustic, into scarifications made by the lancet: the slough separates, and pus is discharged. Instead of promoting a continuation of the discharge, by applying savine ointment, and inserting foreign bodies, or employing other irritating dressings, it is better, when the sore begins to heal, to repeat the application of the caustic to another part; or, when the issue begins to dry up, to apply for a few hours a pledget of strong antimonial ointment.

The employment of the bichloride of mercury, though a most efficient escharotic, appears not to be unattended with danger, as in many instances violent purging, with tenesmus and bloody stools, follow its application. When swelling exists without pain, considerable advantage may be derived from frictions and liniments of various kinds, with careful bandaging. No applications can be of the least avail unless the joint be kept completely at rest.

When there is no pain in the joint, when swelling exists, with or without fluctuation, and there is every reason to believe that the extremities of the bones are not much diseased, a cure may be, in general, obtained by the employment of rest, support, and slight superficial excitement. A practice which has been extensively and rather indiscriminately pursued in diseases of joints and of other parts, in affections of synovial membrane, ulceration of cartilage, disease of bone, and even in cases of necrosis, is here detailed. It is useful in proper cases, very hurtful in others. The joint is well washed with soap and water, and afterwards rubbed with camphorated spirits of wine: it is then covered with an ointment spread on lint, and composed of equal parts of the unguentum hydrargyri cum camphora and the ceratum saponis — in the majority of cases the mercurial ointment would be better omitted — strips of lead, soap, or adhesive plaster are then applied with a moderate degree of tightness round, from two or three inches below the joint to the same distance above it: these are covered with soap-plaster spread on thick leather, and the whole is surrounded with a bandage, which extends from the extremity of the limb. The bandage should be put on as far as the joint, before the plasters are applied. The irritation produced on the surface tends to check the deep-seated action, whilst the compression excites the action of the absorbents to remove the effused fluids, and thus to reduce the swelling: by the joint being kept completely motionless, not the least salutary indication of the treatment, the cartilage and bones, if ulcerated, are placed in a condition tending much to expedite their restoration to a natural state. If they are diseased to such an extent that the process of cicatrisation cannot be expected, a cure by anchylosis is, by these means, much more likely to occur. The dressings may be left undisturbed for the space of a week or two; at which period, and, in many cases, sooner, they will be found much slackened, in consequence of the swelling being greatly reduced. By repetition of the application at intervals, the disease will, in a great many instances, rapidly cease, and the joint resume almost its natural appearance; but the period at which this takes place will be found to vary much according to circumstances. If, however, the plasters produce such irritation as to cause a return of inflammatory action, their use must be discontinued till such action has been subdued by the usual means. If the thickening of the external parts has occurred to such an extent as to cause immobility of the joint, or if partial anchylosis has ensued, the limb may be brought to the most convenient position, the knee nearly, but not quite, straight, the elbow half bent, and so on, by the cautious use of a jointed splint, fitted with an extending screw. The practitioner is not to be deterred from having recourse to the above practice, even when matter has collected and burst externally, for sometimes under its employment the cavities of abscesses contract rapidly. After the swelling and other symptoms of disease have subsided, the joint is to be slightly moved, but with great care; and, by a gradual increase of the movement, the natural motion of the part may be ultimately restored. The great object in treating chronic affections of joints must be to give them support, and prevent motion as much as possible. This is effected pretty well in the articulations, removed from the trunk, by the process above described, modified according to circumstances. The filth and smell arising from the plasters often becomes annoying, and, above all, the eruptions and excoriations produced by them prove so troublesome that the application requires to be discontinued. The principal and most essential indication, that of securing repose to the affected parts, is fully as well obtained by the application of well-adjusted splints. These may be formed of lint soaked in a mucilage of gum acacia, as described in the *Practical Surgery*, p. 150, or coarse linen may be smeared over thickly with a coating of mucilage mixed with common whiting, and another layer of linen spread over that. This is laid out smooth and allowed to dry; portions of this sheet are cut to the form of the affected joint, and, after being moistened, are applied and retained by a roller. A firm case is thus formed, which may be afterwards lined with lint or cotton wadding, and so reapplied. The most suitable splints of all are made of leather, prepared without oil, softened in warm water, and put on as above described. They are, when they have become dry, pared and well fitted, then lined with wash-leather, and padded as may be required. The employment of these splints gives great relief in cases where further excited action has been lighted up in the joint in consequence of the surface of the articulating cartilage having become ulcerated from its free or attached surfaces, or in consequence of matter finding its way into the synovial cavity from the cancelli in the head of the bone. In cases, also, where the painful sensations have existed from the first, and even before any great alteration in the external form of the joint has taken place, indicating primary ulceration of cartilage, this practice affords immediate relief. These splints are easily applicable to the shoulder or hip-joints; and, in the majority of instances, nothing further requires to be done. It appears that Dr. Physick of Philadelphia had been for many years in the habit of confining the motions of the hip-joint by means of hollowed wooden splints, and his practice was marked by very favourable results.*

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* [Dr. Physick (*American Journal of the Medical Sciences*, Vol. VII., p. 304) was always in the habit of commencing the treatment of hip-joint disease by the administration of a mercurial purge. The preparation which he commonly used was calomel, of which he gave to a patient from six to ten years two or three grains at bedtime, followed the next morning, unless it should have previously acted well, by a dose of oil. If, after having kept the patient perfectly quiet for a few days, he found the parts inflamed, swollen, and tender to the touch, he abstracted from six to eight ounces of blood, by the application of a sufficient number of leeches. Unless the inflammation was very acute, with a good deal of febrile disturbance, he did not prescribe much reduction in the diet, which was generally of a light wholesome character. His next object was to institute a course of steady and systematic purging, which he regarded as far superior to emetics, fomentations, blisters, setons, and caustic issues, so much employed by other practitioners. The articles which he selected were cream of tartar and jalap, which were given every other day in sufficient doses to procure several copious evacuations. These medicines were occasionally changed, either as they lost their effect, or as the patient took a dislike to them.

Having pursued the above plan for a few weeks, and accustomed the patient to his confinement, the next object was to insure perfect rest to the diseased joint, the most essential item of the whole treatment. To this end, a carved splint, long enough to extend from the

It is seldom that local abstraction of blood is at all required, and its employment in cases of morbus coxarius in weak constitutions, which it generally seizes upon, is very questionable. Neither is counter-irritation called for; and it is only in extreme cases, when the suffering is intense, that small blisters over the fore part of the joint, or a slight drain in that situation, or behind the trochanter, is admissible. The nitrate of silver rubbed on the surface causes vesication and discharge; and its early repetition is often followed by good effects. The tincture of iodine, or a liniment containing sulphuric acid, may sometimes be applied with the same view. There is no doubt whatever, that much of the benefit that attends upon counter-irritation, both in the human body and in the lower animals, is to be attributed to the rest that is at the same time enjoined, and often indispensable. It is thus that the firing and blistering of horses does good in the majority of the diseases of tendons, bursæ, bones, and joints. In some instances, it may be necessary to have recourse to soothing applications, as fomentations to affected joints, and to employ general antiphlogistic means suited to the age, strength, and constitution of the patient. In the greater number of cases in young subjects, after the stomach and bowels are unloaded, the system must be supported by tonics and nutritious food; none are more beneficial than the preparations of iron.

When the occurrence of anchylosis affords the only hope, this process ought to be encouraged by rest, and the limb at the same time kept in that position which will be most useful in after life; this will be effected here also by the employment of splints.

In cases of disease of the knee, ankle, elbow, or wrist joints, notwithstanding everything that can be done, the disease often runs its course, abscesses form and give way, the patient's health declines, and he becomes emaciated and hectic. In such cases amputation, when not contraindicated by internal disease, must be had recourse to, as the only remedy. In some few instances, the excision of the diseased extremities of the bones may supersede this operation; but

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middle of the side of the chest nearly to the external malleolus, and sufficiently wide to reach nearly one-half round the parts into which it was to lie in contact, was adapted to the shape of the limb, carefully padded on the inside, and secured by two rollers, one of which was passed round the trunk, the other round the limb from the ankle to the top of the thigh. When the limb is much bent or distorted, it should by no means be forced into a straight position in the first instance; on the contrary, the splint should be angular, to accommodate itself to hollows and projections of the parts, and, as the cure progresses, another less crooked should be substituted. It is rarely that more than two splints are required, though Physick was sometimes obliged to use as many as three or even four in the same case. During the whole treatment the patient should lie upon a hair mattrass, and the apparatus kept steadily applied until all the symptoms of the disease have vanished, which is seldom under twelve months.—Ed.]

this will be discussed in a future part of the work. Every circumstance must be well weighed before mutilation be resorted to; and there can be little doubt that thousands of limbs have been saved by the employment of the means above mentioned, which would have been otherwise doomed to amputation.

Hydrops articuli will in general be got rid of by the use of friction, either dry or with liniments; by stimulating plasters or by blisters; and by the proper application of bandages. Mercurial ointments are used in this affection, and often with very great benefit. Electricity has been recommended.*

In neuralgic affections of joints, it is clear that the symptoms are to be combated by general and not by local means, at least of a severe nature. The patient must be amused and occupied, exercise in the open air must be enjoined, and attention paid to diet. The state of the digestive organs and secretions should be looked to, and corrected if need be. Medicines directed to the regulation of the functions of the uterus are essential in the majority of cases. When there is reason to suspect the lodgement of sordes or worms in the intestinal canal of children so affected, the balsam of copaiba, in doses of ʒss., or more, on an empty stomach, followed, if need be, by brisk purgatives, will be found to answer admirably. Tonics, such as preparations of iron, of quina, &c., are then given with advantage: many apparently bad cases yield at once to such treatment.

As local applications, anodynes, fomentations, or cold lotions are employed, according to circumstances. Frictions with gently stimulating liniments, belladonna, veratria, &c., may be used as occasion demands. The patient must be encouraged to use the affected limb as much as possible; and the use of all severe and heroic remedies, as bleeding, blistering, counter-irritation, setons, issues, or moxas, discountenanced.

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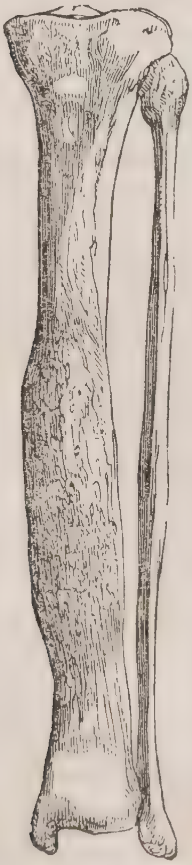
* [The treatment of this affection must be chiefly of a local nature, although it may sometimes be necessary to resort to constitutional means, especially mercurial purgatives. When dependent upon a gouty or rheumatic state of the system, the different preparations of colchicum may be exhibited with a prospect of advantage, as also the hydriodate of potash in large doses. As a local remedy, blistering is by far the most prompt and effectual, and worth all the liniments and unguents that have ever been devised. The discharge from the vesicated surface may be maintained by savin or tartar emetic ointment; or, what is preferable, the fly may be reapplied as soon as the sore becomes dry. The operation of the blister should be aided with a bandage and a piece of oiled silk, or strips of adhesive plaster, to support the distended ligaments. Should these means fail, or the accumulation be so great as to impede the motions of the joint, and render it probable that absorption cannot take place, a small valvular incision may be made into the most dependent situation of the swelling, to draw off the fluid. Such a step, however, although justifiable under the circumstances here indicated, should not be taken without due reflection. — Ed.]

OF INFLAMMATION OF BONE, AND DISEASES THENCE ARISING.

Bones grow and are nourished by the same means, and are subject to the same laws, with other parts of the system. Like all the tissues of a white colour, particularly when their growth is completed, they are less freely supplied with bloodvessels and nerves than other parts. When incited action of the bloodvessels occurs in the harder textures, sensibility is roused to an exquisite degree, and the healthy and perverted processes often advance with great vigour and amazing rapidity.

Inflammation of bone often arises from external injury, and in some constitutions from very slight causes. Its occurrence is supposed to be favoured by a syphilitic taint, but the inflammatory disposition is much more frequently produced in a system vitiated by the abuse of mercury. From the unyielding nature of the tissue, the pain attendant on inflammatory action is dreadfully excruciating; it is also most violent during the night, even in chronic cases, a circumstance which does not admit of satisfactory explanation. The integuments over the inflamed bone are swollen, and the tumour is œdematous; whilst a hard and solid tumefaction exists in the more deeply-seated parts, caused partly by enlargement of the osseous tissue and partly by effusion of lymph into the cellular substance. The bone is imbedded in a gelatinous or lymphatic effusion, situated mostly beneath the periosteum. This membrane is more vascular than in its natural condition, thickened, and at the same time opened out in texture. The bloodvessels of the affected bone are much increased, both in activity and in size; and, in consequence of enlargement of the vessels, and thickening of the naturally delicate membrane on which the vessels ramify, the bone is swollen and increased in size; its texture, as shown in the annexed cut, is loose, somewhat resembling the cancellated structure, and its surface is occupied by numerous foramina, which are enlarged in proportion to the size of the vessels which they contain. The limb is often enormously swollen and indurated. The gelatinous effusion beneath the periosteum speedily becomes organised, nodules of osseous matter project into it, and adhere to the surface of the bone frequently by a narrow neck; these increase in number, gradually assume a solid appearance: the bone is thus thickened, often to a very great extent.



It has been supposed that the new osseous matter is deposited by the vessels of the soft parts and of the periosteum; but there can be little doubt but that it is secreted principally by the vessels which ramify within the substance of the bone, and by the vessels of the periosteum after they have entered the osseous tissue. Thus, in the case of fracture, the new osseous particles lie between the periosteum and bone at a distance from the broken ends, where the vessels are enlarged and increased in activity, or adhere to fragments which have been detached in part and retain their vitality, but not to the under surface of the periosteum. There is no doubt that thin laminæ of bone are now and then found attached to the periosteum, or impacted within its substance; but this is to be attributed to that morbid action of the tissue, to which this as well as several other membranes is subject.

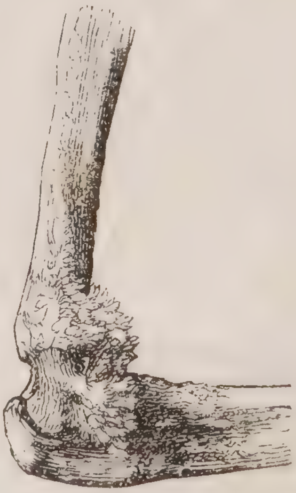
When bone is extensively affected with inflammation, motion is impaired; the muscles being displaced and retarded in their action by the swelling and irregularity of the bone, by effusion of lymph into their tissue and inter-muscular spaces, and, perhaps, also, by their partaking, in some measure, of the inflammatory action. Any attempt to move the parts very much aggravates the patient's suffering. Occasionally inflammation attacks almost all the bones in the body, and causes great constitutional disturbance, by exhausting the powers of life: it sometimes terminates fatally. Bones become inflamed from various causes. However it originates, the action ends, as in the other tissues, in resolution, suppuration, or mortification. The effusion by which the diseased vessels naturally relieve themselves in softer textures cannot here take place so readily, or to such an extent as to prove beneficial: the intensity of the action is with difficulty subdued, and, consequently, resolution is comparatively rare. When it does occur, the parts do not soon regain their natural condition, but often remain considerably swollen and indurated, as is seen in nodes, which continue during the life of the patient, without causing pain or much inconvenience.

Suppuration on the surface, or in the centre, and partial or total death of a portion of bone are the most frequent consequences of external injury and incited vascular action; but suppuration in the cancellated texture frequently follows very slight incited action in those of a scrofulous habit. Tubercular matter exists, in all probability, previously, and it leads very often to long continued disease, curable only by operation. The matter may find its way to the surface after long suffering and great constitutional disturbance. Again, it may be confined for months, or even years, the patient suffering from time to time the most excruciating agony. The bone becomes thickened towards the surface by new deposit, as the cavity is increased by ulcerative absorption, and relief is only afforded, a correct diagnosis having been formed, by artificial evacuation of the matter. In many cases small sequestra lie in the cavity; and though the matter escapes naturally, or is evacuated, the patient's strength becomes worn out, and he perishes, unless the limb is removed. So long as dead portions of bone remain, the discharge cannot cease permanently. Fresh collections are apt to form in the soft parts if the original openings close. It is no easy matter to discover or remove sequestra from deeply seated bones. A section of the femur is represented on the next page, showing a cloaca leading to the cavity of an abscess in the medullary canal. The bone is very dense in consistence, and irregular on its surface.

Suppuration in bones is necessarily connected with loss of substance, and condensation of the surrounding parts; and purulent collections exteriorly, if allowed to press long, or if bound down by unyielding sheaths, will sooner or later produce a breach of continuity, by causing absorption of the outer lamella and the subjacent cancellated texture. A similar effect is produced by aneurismal and some other tumours. Such loss of substance is, in some instances, speedily repaired, after removal of the cause, by effusion of new matter from the surrounding bloodvessels of the bone; thus, in disease in consequence of pressure from large aneurism, there is reason to suppose that the healing process commences as soon as the aneurismal sac begins to diminish, as after operation. But, as has been already observed, the healthy actions are more vigorous in the softer tissues than in bone; and when ulceration has occurred in the latter, it is generally attended with weak action, and presents the same general characters as an ulcer in the soft parts, connected with a feeble action of the bloodvessels; the discharge is thin and fetid, absorption gradually proceeds, and there is little or no effort towards reparation. Cavities in bones are necessarily slower in healing than those in the soft parts; the vitality and power of reparation are lower; and there being no elasticity in the parts, the walls cannot come rapidly together, contract and coalesce. It may tend to prevent confusion of the two different morbid states, if we confine the term ulceration to suppuration in, and absorption of, bone, whilst the vessels retain a considerable power of action, throw out new matter, and procure a reparation of the breach; and this condition of the osseous tissue exists when the disease is situated in the surface of the bone, and when it has been produced by an external cause. On the contrary, the term caries will denote that peculiar kind of ulceration in which reparation is hardly attempted by nature, and is with difficulty obtained by the most active interference; and this disease will most generally be found to affect the cancellated structure. The comparative frequency of one or other of the terminations of inflammation depends much on the kind of bone implicated.

Caries most frequently occurs in the heads of long and in the cancellated structure of the short bones, as unhealthy suppuration most frequently takes place in the loose, fatty, and cellular tissues of the soft parts. The formation of abscess in the cancelli is generally preceded by deposit of tubercular matter, isolated or collected in masses, and by the softening of this cheesy substance. When pus has formed in the substance of a bone, the outer lamella, in the end, becomes absorbed, and the effusion undermines the periosteum, which, from the distension, also ulcerates: the matter then spreads into the neighbouring cellular tissue, or makes its way to the surface, and is evacuated, or, what is still worse, it escapes into an articulation. The discharge is often continued, as already stated, in consequence of a dead portion of the cancellated structure being imbedded either in the carious cavity, or in the soft parts, where they sometimes are lodged for a long period.

It was formerly remarked that bones become highly sensible from incited action; hence, during the progress of this disease, which is attended with more or less inflammation, the patient generally suffers most excruciating agony — so great, in general, as to prevent him, perhaps for weeks, from enjoying the least repose. The affected part is considerably swollen, but the enlargement is seldom so general, or so great as in the diseased state of the ligaments and other apparatus of a joint. White swelling, however, may be the precursor of caries; or, in other words, a disease commencing in the bursæ, ligaments, synovial membrane, or cartilage, may extend to the bone; and breach of continuity, attended with weak action, be the consequence. In caries the affected portion appears neither to possess vitality enough to enable it to repair the breach, nor to be sufficiently deprived of vitality to be thrown off by the surrounding parts. Considerable portions of dead bone are occasionally found in carious cavities, in the heads of bones, and even in the vertebral column. Small portions are also detached piecemeal in the progress of ulceration, and discharged; but it is seldom that the whole surface is thrown off, so as to give place to a healthy and reparative action. When the parietes of the cavity have remained a considerable time in this inactive state, the surrounding vessels become more active, and the surface of the bone in the vicinity is studded with nodules of new osseous matter. The disease here delineated affected only a small portion of the cancellated texture of the condyle. An ashy looking substance fills the cavity, and this again was concealed in the recent state by lardaceous matter. The elbow joint is unaffected, excepting only that, from the deposit of new bone in spiculæ and nodules, and the condensation of the soft parts, almost complete anchylosis had taken place. This deposit is not always limited to the affected bone, if one only be the seat of the disease, but frequently extends to those articulated with it. The soft parts are commonly more or less thickened, and rendered exceedingly dense by effusion of lymph into the cellular texture; and so great is this thickening sometimes, that the knife is resisted as if by cartilage. The discharge which proceeds from the carious part is generally highly fetid, very profuse, is often poured through several openings, and the surrounding skin is excoriated and generally of a livid colour. The ichorous discharge occasionally dries up for a short period and again breaks out more violently. The surface of the ulcer is, insome cases, occupied by soft unhealthy granulations; in others the earthy part of the bone is most prominent. When the parts have been macerated and dried, the disease is often found to have proceeded more in width



than in depth, and the absorption has not reduced all points of the diseased surface to the same level, thin portions remaining somewhat elevated, and giving the part a cancellated appearance; and there often project numerous minute osseous fibrillæ of considerable length, which intermix with one another, and form a most delicate network. In other instances, the ulceration has extended more deeply and uniformly, and a considerable cavity is formed, with irregular margins and surface; not unfrequently it contains dead portions of the cancellated structure, in some of a dark, in others of a light colour; or it is occupied, in the recent state, by a substance resembling lard. The surrounding bone is much softened, and, after maceration, becomes exceedingly light. The disease is generally confined to one or two bones, but occasionally involves a whole chain. It may be limited to a part of one bone in a joint, or may embrace the whole of it. Its extent will depend on the severity of the primary action, or on the degree and duration of the pressure of fluid which has been allowed to exist, whether from the nature of the superincumbent texture or the carelessness of the surgeon.

Interstitial absorption of those bones which are in the neighbourhood of the carious ulceration often occurs in the tarsus and carpus. The superincumbent integuments are livid and cold, and pain is felt in the situation of the bones; yet they are not affected with continuous ulceration, but portions of their substance are gradually removed by absorption, so that they are much loosened in texture, and may be altogether destroyed, or come to consist merely of a thin and reticulated osseous shell, whilst at the same time their cartilaginous surfaces often remain in their healthy condition.

The constitutional disorder attendant on caries is at first very great; the sympathetic fever is followed by hectic, under which, and the discharge, many patients sink. The general affection in some degree keeps pace with the local in violence and duration. The irritation is in some cases so great as to destroy the patient in a very few months or weeks; but not unfrequently a constitution, by no means strong, will be enabled to bear up for a long period under very extensive disease of a bone. The paroxysms of pain and inflammation occasion fresh attacks of constitutional derangement: this occurs till the patient's health and strength are exhausted, and he sinks under the disease, or is relieved by the spontaneous or artificial removal of the cause.

A natural cure of caries may occur in consequence of the diseased parts so far recovering their natural degree of vascular action as to form granulations and repair the breach; but most frequently it is necessary, for the accomplishment of this purpose, that incited action occur to a very considerable degree; and the diseased parts, already extremely weak, have not sufficient power to withstand the action, but perish; whilst the action of the surrounding parts, not being increased to such a degree as to overcome their powers, throws off the dead, secretes a more bland discharge, and deposits healthy granulations, which gradually fill up the cavity.

Treatment. — In inflammation of bone, resolution must be brought about, if possible; the other terminations are to be prevented by all possible means, since they frequently endanger the limb, and even the life, of the patient, and, at best, never admit of a speedy cure. To promote resolution, blood must be drawn copiously from the part; and general bleeding may also be required, though in some constitutions it cannot be safely carried to any great extent. After local bleeding, fomentations assiduously applied will tend much to relieve the sufferings of the patient. Purgatives, nauseating doses of antimony, and all safe measures likely to subdue the vascular action, must at the same time be adopted. Free incisions through the periosteum sometimes relieve the pain, and cut short the disease, the distended vessels being thereby emptied; but such practice is only a last resource, when the action has resisted all other means, and threatens an unfavourable termination. If, notwithstanding the resolutive means employed, the inflammation proceeds unabated, and suppuration occurs, the effused pus ought never to be allowed to remain on the surface of the bone, but must be evacuated by early incision. Otherwise the pressure of the extraneous fluid will cause absorption of the bone, or detachment of periosteum and superficial necrosis; the absorbed surface will, in its turn, secrete pus, and thus an ulcer will be produced; and, from the vascular action becoming debilitated in consequence of the previous incitation, that ulcer will in all probability degenerate into caries. Much mischief is produced by squeezing and bandaging tightly the inflamed parts, as can readily be understood; yet such practice is frequently adopted after suppuration. By it the inflammatory action is excited anew, the formation of matter is very much increased, and however useful such manipulation may be in stiffness of a joint, or mere swelling of bursæ, and sheaths of tendons, still, in inflammation and abscess of bones or joints it is extremely prejudicial, and from its indiscriminate employment by those ignorant of the profession, many limbs have been destroyed. General chronic periostitis, which is produced by exposure to cold, or occurs after or during mercurial courses, and is often supposed to be a symptom of syphilis, is relieved by the internal exhibition of the bichloride of mercury, or other mercurial preparations, combined with sarsaparilla and diaphoretics. In many instances such an affection will yield to no other treatment; and thus the practitioner is occasionally obliged to have recourse to a somewhat paradoxical practice, that of giving mercury for a disease which seems to have been produced by that mineral.

In inflammation of the short bones or heads of the long bones, if the action do not yield to topical bleeding and becomes chronic, counter-irritants must be employed. Blisters repeated are often useful in subduing the remaining action, and in obstinate cases small caustic issues are sometimes of service. During the adhesion of the eschar, the best application is a common poultice or water dressing, which, on the separation of the dead part, may be exchanged for any simple ointment, it not being at all desirable in general to check the discharge and heal up the breach of surface. Moxa is sometimes employed to make an issue in these and other cases, but it is not superior in any respect to the potential cautery, whilst its employment is generally very alarming to the patient. The sores following the use of the moxa are in some instances tedious in healing; and this may be ascribed to the vitality of the surrounding parts having been diminished by the application.

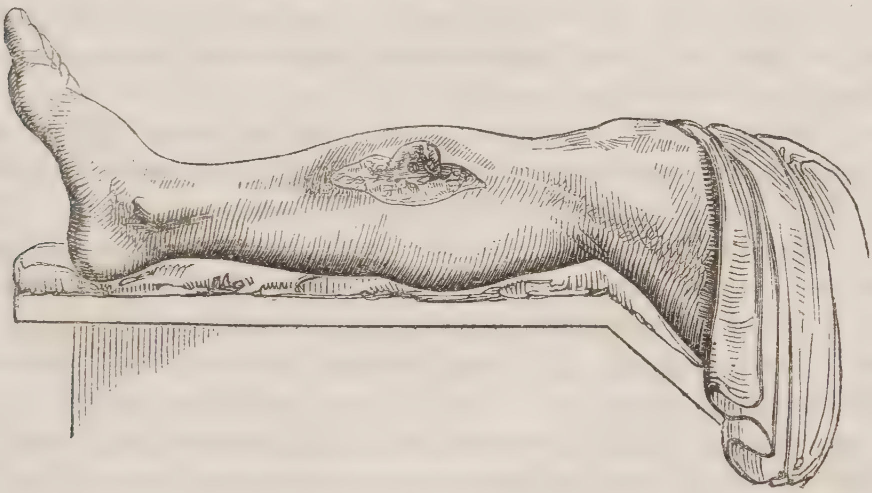
In cases of atrophy of bone, and where there is reason to suspect the scrofulous or tubercular deposit to be going on, the affected part should not be much used, and means taken to give tone to the system. Preparations of iron are often exhibited with advantage. The combination of iodine with iron may sometimes answer. Abscesses should be opened early, so as to prevent extension of the mischief. In abscess in the shafts of the long bones, it is occasionally necessary to make an opening through the outer lamella by the trephine, so as to evacuate its contents. Some instructive cases have been given by Sir B. Brodie, illustrative of the good effects of this practice. I subjoin one out of many from my own hospital practice.

"W. A., aged 22, was admitted Oct. 26, 1837, under the care of Mr. Liston. He is a policeman of weak conformation. He states that when about six or seven years of age he was first attacked with an aching pain in the right leg, near its middle, and since that period has been subject to three or four attacks every year. These usually were experienced in the spring, during rough, windy, and cold weather, and continued from one to three weeks. The pain was always aggravated at night, and so trifling in the day that he was always able to go about. These attacks ceased to occur when he was between 15 and 16 years of age, and since that time, until last May, he has been free from them. He states that up to about his 16th year the bone of the leg gradually enlarged in its middle portion, but then became stationary, and at the period of entering the police the difference between the bones of both legs was not great; this was about two years ago. Since then he has been accustomed to walk for a considerable length of time daily. During some months he was obliged to do the night work, and then he was much exposed to cold and wet. Last May, while thus engaged, he experienced again an aching pain in the middle of the right tibia; this was aggravated at night; and after a fortnight's duration, during which it became gradually worse, he was obliged to give up his duties in the police, being unable to continue them any longer. At this time he consulted the surgeon of the subdivision with which he was connected; his treatment was fomentations to the leg and aperient medicine occasionally. Not being much relieved by this, he afterwards ordered the application of leeches on three several occasions, and mercury to salivation. At the end of three weeks he returned to his duty. In the latter part of September he was again attacked with pain during night duty; this pain increased rapidly in severity, and after three nights he was again obliged to leave duty. He was now treated again with the frequent and copious application of leeches at different intervals, and likewise took some pills, which did not affect his mouth. This treatment, with frequent fomentations, was persevered in for a month, but without permanent benefit, and then he was brought to this hospital. Has never had any syphilitic complaint.

"*Present state.*—Has an enlargement of the tibia about its middle third, of a diffused character, and which seems to extend a good deal inwards and backwards; in this part he experiences a throbbing and lancinating pain at night; during the day he is in general easy; at night there is considerable heat and swelling in the leg; tongue whitish; appetite good. The following pills were ordered: — ℞. Bichloride of mercury, two grains; powder of gum guiacum, two scruples; oil of sassafras, ten minims; extract of sarsaparilla, four scruples. To be divided into twenty-four pills, of which let two be taken three times a day. Apply eighteen leeches to the affected part.

"Nov. 4. The leeches were repeated; much the same.

"8. Symptoms as before. As he complains of pain over the eyebrow, with nausea, let the mercury be left off. A variety of constitutional and local treatment has been pursued during Mr. Liston's absence from the hospital, but without affording any relief; the patient's nights were passed in great agony, and his general health began to suffer. On the 27th, after consultation with Mr. Fisher, the surgeon to the Police Force, Mr. Liston had the patient carried into the operating theatre. He made an incision along the spine of the tibia of about three inches in extent; another shorter one was made to fall on this at right angles from the inner side. The surface of the bone thus exposed was perforated to the depth of fully half an inch by a small trephine. A very dense circle was removed from the perforation; still the fluid, which was suspected to exist, did not appear. Mr. Liston, encouraged by the intense pain complained of as the process of perforation proceeded, again applied the crown of the instrument, and after a few more turns, brought out a further circle of considerable thickness, and this was forthwith followed by a flow of well-digested purulent matter.



"28. Complains of no pain comparatively; slept well last night after an anodyne draught; has felt much relieved since the operation; a good deal of matter was discharged from the sore during the night; water-dressing to be applied to the wound.

"30. Slept well without any anodyne the last two nights. The relief afforded by the operation is felt more now than it was at first.

The wound discharges a good deal. A tonic mixture, containing infusion of gentian, sulphate of magnesia, and sulphuric acid, was ordered.

"Dec. 2. The wound looks florid and clean; granulations are springing up; general health very much improved.

"4. The edges of the wound are thickened by the granulations; the discharge from the wound still considerable; feels quite well in health.

"12. The wound continues much the same; the rollers have been discontinued.

"14. Feels himself gaining strength daily; can walk without pain; wound is contracting and hard; granulations seem to lessen the depth of the opening in the bone; there appears to be no sequestrum."

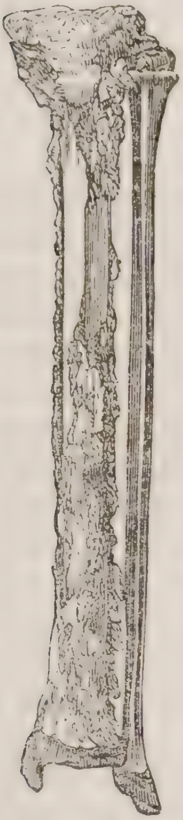
When caries is fairly established, and the integuments have given way, the best and most successful proceeding is that pointed out by nature — destruction of the diseased portion; and the means must vary according to the particular circumstances. In many cases, nature seems to wait but for the separation of the sickly parts, either by accident, or by the interference of art. The means are to remove, partially or wholly, the diseased part, or to effect such a change of action as will throw it off. The first indication will be accomplished by trephines, scoops, saws, and forceps; the second by active escharotics; frequently both are required.

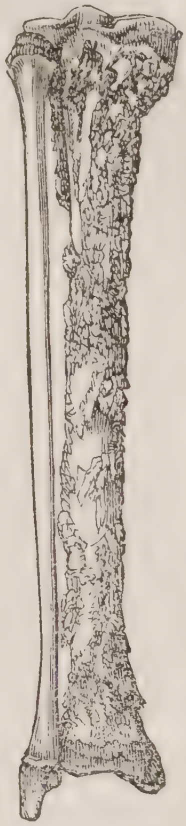
If there be extensive disease in the medullary canal of a bone, several perforations may require to be made, and these may be connected by the use of a small saw, or the cutting forceps. The diseased cancelli, thus exposed, can be readily removed by the scoop or graver, as recommended by Mr. Hey, primus, in his excellent work. If, with the probe, it is ascertained that a portion of the cancellated texture has become dead and loose, it is to be removed after dilatation of the external opening. It may frequently be difficult to distinguish in the effused blood, between what is diseased and what is not; it will often be necessary afterwards to cauterise freely the exposed surface, and for this purpose the oxidum hydrargyri rubrum ought generally to be preferred. The slough will soon be thrown off, and healthy granulations fill up the breach. The application of the actual cautery may be by some considered necessary: at one time I employed this remedy very extensively in caries, and occasionally with very good success; I have since, however, been led to change my opinion, and am now inclined to prefer the potential cautery already mentioned. By the application of the red-hot iron, the diseased portion is destroyed effectually, but at the same time the vitality of the surrounding parts is often very much weakened and their power of reparation diminished, so that they are incapable of assuming a sufficient degree of action for throwing off the dead part; their action being increased whilst their power is diminished, they may become affected with caries, and thus, instead of being arrested, the original disease will either be increased, or extensive necrosis may take place. The red oxide of mercury is not calculated to produce such bad effects; it does not spread or insinuate itself into the bony tissue, as liquid caustics are apt to do; and it is sufficiently powerful for complete destruction of the diseased parts. It will be necessary to keep the wound open, by proper dressings, till all the dead portions of bone be discharged, and every part of the parietes of the cavity produce healthy granulations: if the discharge be offensive, its fetor may be corrected by the use of spirituous applications, such as the tinctures of myrrh, opium, or aloes, separately or combined. After healthy granulations have appeared, and the cavity has begun to contract, light dressing is all that is necessary.

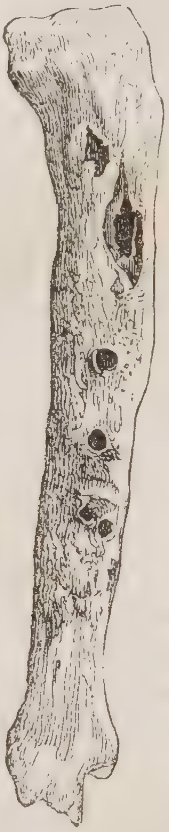
In operating on the carpal and tarsal bones for removal of caries, the surgeon must be well acquainted with the connexions and relations of the parts. If one bone is diseased, its removal will be sufficient; if several, the operation becomes more painful and difficult. When one only of the tarsal or carpal bones is almost completely destroyed, and the surfaces of those articulated with it are also more or less affected, it is not sufficient or safe merely to remove the loosely attached portions of the one primarily attacked; the diseased parts of those surrounding it must also be taken away, and it will often be necessary to apply the caustic afterwards. In caries of the distal range of bones, the bases of those supported by them are in general involved, and must also be removed. If one only is diseased, with the base of the metacarpal or metatarsal bone attached to it, the removal of these will be enough, and can be accomplished without difficulty. Some have recommended the total extirpation of a metacarpal or metatarsal bone, leaving the finger or toe appended; but the member, when thus left unsupported, can never become of any service to the patient, and may be productive of much inconvenience; whilst removal of them, along with the diseased bone, renders the operation much more easy of execution. If the whole disease can be extirpated, leaving the surfaces of the surrounding bones covered with healthy cartilage, the use of the caustic is not required, and would be productive of harm; but wherever it is impossible to avoid encroaching on the cancellated texture, such as of the os calcis, which it would be unsafe or imprudent to take away entirely, its use is then indispensable. After the removal of carious bones, the symptoms soon disappear, and the patient obtains a rapid, and often permanent cure. The instruments for these operations, and the method of performing them, will be afterwards mentioned. In conclusion, it may be remarked that the temporary cicatrix of a sore leading to a diseased bone has a very different appearance from the sound scar which is formed after its removal. The former is bluish, soft, on a level with the surrounding parts, and moveable; the latter is depressed, white, and firmly adherent to the bone.

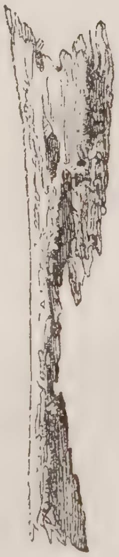
Death of bone, or NECROSIS, is an effect of violent inflammation, particularly of the medullary web, or external injury; a termination of inflammatory action in bone corresponding to sphacelation in the softer tissues. It has been observed, that the bones are not extensively supplied with bloodvessels, and that their natural powers are inferior to those of the softer parts; and from this circumstance the frequency of necrosis can be readily accounted for. The short bones and the heads of the long bones, are more vascular than the flattened bones and the shafts of the long ones. Hence necrosis most frequently occurs in the latter. Necrosis, fortunately, seldom occurs in the heads of the long bones, or penetrates the separation betwixt the cancelli of the shaft and the epiphysis. Bits of dead bone in the articular ends, however, very often lead to disease in the joint. There are in my private collection a few specimens of necrosis, in which matter found its way into the neighbouring joint, leading to disease of the tissues composing it, and rendering amputation necessary for the preservation of the patient's existence. External injury may produce this disease by causing a violent increase of action, or it may be so severe as at once to deprive part of the bone of its vitality. Destruction of the periosteum, and of the vessels which enter the surface of the bone, frequently gives rise to superficial necrosis or exfoliation. Such a result, however, does not always follow; for we not unfrequently find, when the periosteum has been forcibly torn off, to a considerable extent, by external injury, that the part still retains its vitality. When, however, the bone has been at the same time contused, it is extremely probable that external necrosis may occur. Again, when the periosteum has been removed in the most careful manner possible, exfoliation occasionally takes place. If the exposed bone remain of a brownish hue, it will generally retain its vigour; if, on the other hand, the colour is white, it will most probably be cast off. Necrosis may come on at various periods of life, but is most commonly met with in young subjects, in whom the inflammatory action is allowed to make progress before it is noticed or attended to. It may affect the external or the internal part of a bone, or nearly its whole thickness. The whole of a bone seldom or ever dies in consequence of increased action, and it is not often that the entire thickness of any part of it is found to be necrosed. If the entire thickness dies to a great extent, there is no reproduction; the epiphyses approximate, and the limb, if there is only a single bone, must be lost. A large portion of a bone, or numerous small irregular portions, may die; but still a part of the original shaft remains, and by its vessels reproduction is accomplished. The articulating extremity is very rarely destroyed by this disease. Many writers have talked of death of a bone throughout its whole extent, and, in fact, the term necrosis was originally adopted on this supposition.

The progress of necrosis is, as has been said, similar to that of sphacelation. The affected bone gradually changes its colour, and loses its sensibility; a line of demarcation is formed, and ultimately the dead portion is completely detached from the living. Previous to its separation, the surrounding parts, the portions of bone which are not doomed to perish, have commenced forming new osseous matter, which is secreted in nodules, and from continued deposition soon becomes consolidated. The commencement of the process is well seen in the following sketches from specimens in my collection. The disease, as represented in the two first cuts, was of the most acute kind, and a great part of the shaft of the tibia had perished. This is seen at various points through the sort of cortical deposit of new bone. The new bone, in its turn, secretes a texture similar to itself, whereby the deposit becomes more and more extended, and not unfrequently affords an almost complete encasement to the dead portion, or sequestrum, as represented in the cut on the right-hand side of the page. In general bone dies irregularly, so that the sequestrum presents an uneven surface, and its margins are rough and serrated by numerous sharp projections, as seen in the one taken from the tibia, and represented here. From the appearance of the dead bone, it was imagined that after its separation, portions of it were removed by absorption; and this opinion was strengthened by the thin exfoliations of the external lamina being found perforated at several points by minute apertures, — worm-eaten, as it was called. These cases of death of inner or medullary shell are irregularly separated, like any other slough; the remaining living outer shell is enlarged by inflammatory action and deposit. But a dead portion of bone, detached from the surrounding parts, is in every respect an extraneous body, and is not, and cannot be, acted on by the absorbents, any more than a piece of metal, wood, or stone. Some have gone so far as to affirm that portions of foreign bodies, ligatures, &c., are absorbed; but this opinion is altogether too absurd to require any contradiction; the knots of ligatures, like portions of glass, or other foreign substance, become surrounded with a dense cyst, and often remain in the body for a long time; so do portions of dead bone separated by the process here described. A series of experiments were made by Mr. Gulliver, in order to put this question at









rest, many of which I witnessed and assisted at, and several I also repeated. Setons of bone were inserted and worn for a long time ; thin plates of bone were confined on suppurating surfaces ; pieces of bone were inserted in the medullary canal of various animals, and kept there for months, and in one instance for more than a year. These foreign bodies were weighed with the greatest care and accuracy before and after they were so exposed to the absorbents, and were found unaltered in any respect. A paper, detailing these experiments, is published in the *Medico-Chir. Transactions.*

The separation of the dead part from the living is accomplished with greater or less ease, according to the bone which is affected, the state of the constitution, and the general health ; in the bones of the superior extremity, this, as well as every other action, proceeds more rapidly than in those of the inferior. It occurs in consequence of absorption of the living part of the bone, which is in close proximity to the dead. The sequestrum, if large, is not pushed off, as some have supposed, by granulations, deposited on the living margin of the bone. A small portion of the inner shell, when completely detached, may sometimes be observed to be extruded from a cloaca by granulations from the living bone. During its progress, matter forms, makes its way to the surface, and is discharged through minute, and often numerous apertures, which afterwards become fistulous. The soft parts are thickened and indurated, and the integuments are red, and sometimes of a livid colour.

Formation of matter upon the bone is occasionally the cause of necrosis, the periosteum being destroyed or separated from its connections by the pressure or insinuation of the pus. I have seen several instances in which it followed neglected erysipelas of the lower extremity.

The matter is in general thick and laudable ; at first it is secreted profusely, but afterwards in smaller quantity. The external openings, or papillæ, through which it is discharged, are found to lead to cloacæ, or apertures in the new and living bone, which encase the dead, and through these the dead portions can be discovered by the probe ; and it will thus be ascertained whether the sequestrum is fixed or detached : when loose, it can sometimes be moved upward and downward in the cavity. When the shaft of a bone is much affected, the whole limb is enlarged, by the inflammation having extended to a considerable distance above and below the portion about to become necrosed. The unshapely appearance of the limb continues until the sequestra are discharged ; for by their presence incited action is still continued, and subsides only after their removal. Some time before any portion of bone has become dead, or begun to be separated, great effusion of new bone has, in general, occurred ; thus a preparation has been made for the strengthening of the limb, which, after a considerable portion of the bone has been detached, would otherwise be incapable of supporting the weight of the body. The unnatural bulk of the limb is afterwards much diminished, for the new bone gradually becomes consolidated, and smooth on the surface by the action of the absorbents. Nature seems to construct her substitute after the model of the original, and in some instances but very little change can afterwards be observed in the limb.

In external necrosis, or death of the outer lamella, reparation is chiefly made by the subjacent parts; and this species of necrosis occurs most frequently in the flat bones. In necrosis involving a greater thickness of the bone, the new matter is also furnished by the subjacent parts, which, however, are materially assisted in the process by the living bone, which forms the margins of the void caused by the absorbent process for the detachment of the dead portion. The bony matter is deposited with great activity, and frequently columns of the new deposit cross over the sequestrum, binding it firmly down, and rendering it almost immovable, although it may be completely detached from the living parts.

It has already been stated, that those vessels which ramify within the substance of the periosteum have no share in the reproduction of bone, but plastic matter is effused by the ramifications extending from the membrane to the bone: this effusion becomes organised, and greatly assists in forming the substitute.

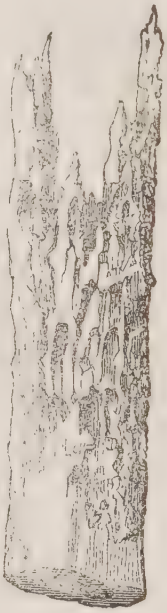
It has been formerly remarked, that a limited, and, on after examination, an apparently trifling necrosis of the cancellated structure, may produce the most violent local symptoms; the painful feelings, the discharge, and the thickening of the bone, continue, as long as the cancellated sequestrum remains; severe symptomatic fever is induced, endangering the life of the patient, and often rendering removal of the limb absolutely necessary.

Occasionally abscesses form at a considerable distance from the necrosed part, and terminate in sinuses, which communicate with the diseased bone, and are consequently long and tortuous, so that examination by the probe is rendered difficult. When necrosis is extensive, there is a risk of fracture occurring, if motion of the limb be permitted before a sufficient quantity of matter has been effused, before nature has had sufficient time for the consolidation of her substitute, and consequently before the new bone has come to resemble the old in thickness and cohesion.

Violent inflammatory fever attends the incited action of the vessels of the bone and periosteum which precedes necrosis. But after the abscesses have given way the painful symptoms subside, and the health seldom suffers to any great extent, the system becoming gradually accustomed, as it were, to the new condition of the parts. Hectic supervenes only when the disease is very extensive, and joints become involved. Frequently fresh collections of matter form as each piece of bone approaches the surface. When the effusion of new bone has extended to the neighbourhood of a joint, its motion may be very much impeded, and, from the limb being kept in a state of rest for the cure of the necrosis, anchylosis may even occur.

Treatment. — The means of preventing inflammatory action from running high and ending in death of bone have been already alluded to — abstraction of blood, rest, purgatives, and antimonials. When necrosis has occurred, no interference with the bone is allowable, unless the sequestrum is quite loose, or unless the patient's health is suffering severely under the discharge and irritation. When the sequestrum can be readily moved about, or when, projecting through the external opening, it can be laid hold of by the fingers or forceps, attempts must be made to remove it. The surgeon ought not, however, to allow it to approach the surface, and project externally, for the natural discharge of the sequestrum is a much more tedious process than the removal of it by art, and by the irritation produced during its spontaneous ejection the inflammatory action is continued, and may prove alarming. Long before it has appeared externally, it must have been completely separated from the living parts, so as to admit of ready extraction by the proper means. When it has been ascertained that the sequestrum is separated, it ought to be laid hold of by forceps, and moved freely upward and downward, so that any slight attachments by which it is connected to the neighbouring parts may be destroyed, whether these be minute filaments which still in some degree retain their vitality, or small portions of newly deposited bone, which are so situated as to prevent the free movement of the sequestrum. In general, no impediment of this nature exists, and the dead bone is easily removed. Before extraction can be accomplished, it is generally necessary to enlarge freely the external opening, in all cases where the dead portion of bone is of considerable size. If, on thus exposing the parts, the sequestrum be found detached, but still firmly bound down by the substitute bone, deposited over it either in one continuous sheet, or in irregular columns, this must be divided by a trephine, a small saw, or cutting pliers, before the sequestrum can be extracted. When a dead portion of bone, of considerable length, is exposed at its centre, whilst its extremities are entangled by the old or substitute bone, the division of the exposed part of sequestrum, by means of the cutting pliers, will often be sufficient for its removal, the cut ends being seized by the forceps, and one half removed after the other; thus the perforation or removal of any portion of the substitute will be rendered unnecessary. The instruments, and especially those for extraction, ought to be very powerful, and suited to the purpose; for in the employment of inefficient means there is much folly and cruelty. Incisions into a necrosed limb are attended with profuse hemorrhage from the enlarged and excited vessels; and in some cases it is with difficulty arrested, in consequence of retraction of the cut ends of the vessels not taking place within the condensed and indurated parts. Pressure, and an elevated position of the part, will generally be found to answer. When necrosis has been extensive, the limb must be carefully supported by the application of splints and bandage, till the process of reparation be completed, in order to prevent fracture of the recently formed substitute. This proceeding is seldom, however, necessary.

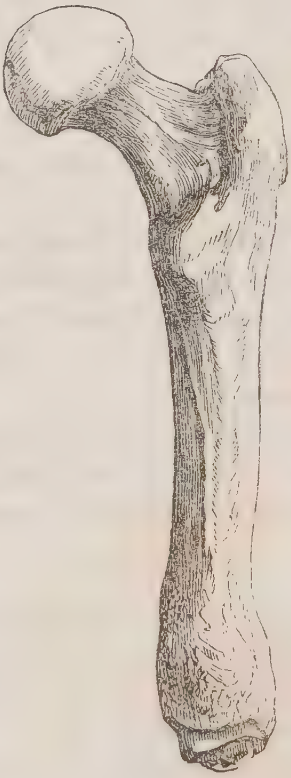
The treatment may be summed up in a very few words. Prevent the necrosis, if possible; open abscesses whenever they appear; encourage the patient to move the neighbouring joints; support the strength; remove sequestra when loose, but do not interfere till they are ascertained to be so; give the limb proper support and rest, when a large sequestrum is formed. When fracture has taken place, when the health has been undermined, or when neighbouring joints have become diseased, amputate, in order to save the life, if it be impossible to save the limb.



It is almost superfluous to remark, that leeching and blistering are worse than useless after necrosis has occurred, however useful they may be in preventing it; and that the adoption of measures to promote the dissolution and absorption of the sequestra are glaringly absurd.

Necrosis, after amputation, was formerly frequent; but in the present improved state of this operation it is so rare as scarcely to demand separate consideration.

Such specimens as here depicted are common enough in the collections of those who have practised the old round-about operation; in fact, it is only by this painful and tedious interference of nature that a tolerable stump is formed in many of these cases. Death of a small portion will sometimes, though very rarely, follow even a very well performed amputation, if through any mischance the recovery is slow, and wasting discharge takes place with emaciation. It happens sometimes, as when secondary hemorrhage (that is to say, bleeding after the fourth day) has taken place, that the flaps are separated by the coagula, and it may be impossible to bring the parts together and give them due support; then the muscles, wasted and shrunk, may leave the bone a little, but the exfoliation is but very trifling.



The inner shell of bone, as may be seen in the above sketch, perishes more extensively than the outer; and this arises probably from inflammation of the medullary membrane, in consequence of exposure, or, perhaps, from its being sometimes injured by the operator or assistants seizing the bone rudely to steady the stump, in order to facilitate the ligature of the vessels. In experiments on animals, the disturbance and injury of the medullary membrane is followed by internal necrosis, thickening of the outer living shell, and effusion betwixt the periosteum and bone. New bone is also furnished from the medullary canal, as is also shown in the sketch.

FRAGILITAS OSSIUM

Occurs chiefly in old people, whose bones contain an undue proportion of earthy matter, are endowed with little vascularity, and filled with an oleaginous fluid. They contain an undue quantity of phosphate of lime compared to the gelatin; and the liability to fracture is further increased by the interstitial absorption of the outer shell. They are in an atrophied state, and this is often in part attributable to disuse of the limbs. This state of the osseous system very often follows upon an attack of rheumatic fever, and is met with in patients who have laboured under cancerous affections.

The bones, when in this condition, often break from the slightest force applied; as from the action of the muscles when the patient turns himself in bed, whilst walking across the room, or when endeavouring to attain the erect posture when seated on a chair. After fracture the process of reunion is extremely slow, and it does not take place at all in patients very old and of worn-out constitution. With a view to prevent the occurrence of fracture when the bones are in this condition, for it is impossible by any treatment to prevent the change in the texture of the bones, the only rational indications seem to be to keep the patient on a generous diet, and to prohibit him from making any great muscular exertion — to avoid, in fact, all circumstances likely to produce a sudden action of any particular set of muscles.

OF MOLLITIES OSSIUM, RACHITIS, ETC.

These affections differ only in this, that in the latter the earthy matter is not deposited originally, whilst in the former it is absorbed after having been deposited; in both the result is the same. The latter is peculiar to the very young, the former to those of an advanced age.*

Rickets and mollities ossium seem to differ also in this. In the latter there is seldom, if ever, any reparative action. The diseased process of deposit continues in the bone, the softening increases, and the patient ultimately perishes. Whereas, in rickets, the softened and yielding state of the bones is only temporary: after a time earthy matter is deposited in due quantity, and the bones become compact, firm, and solid, capable of supporting the weight of the body, though necessarily permanently bent and deformed, if proper means have not been employed during the softened condition. The thickness of the rickety bone, as Mr. Stanley has shown, takes place on the concavity, which is the situation where the greatest strength may be added with the least expense of new matter. In the same way the reparation of fractures not accurately adjusted goes on most actively in the concavity formed by their displacement.

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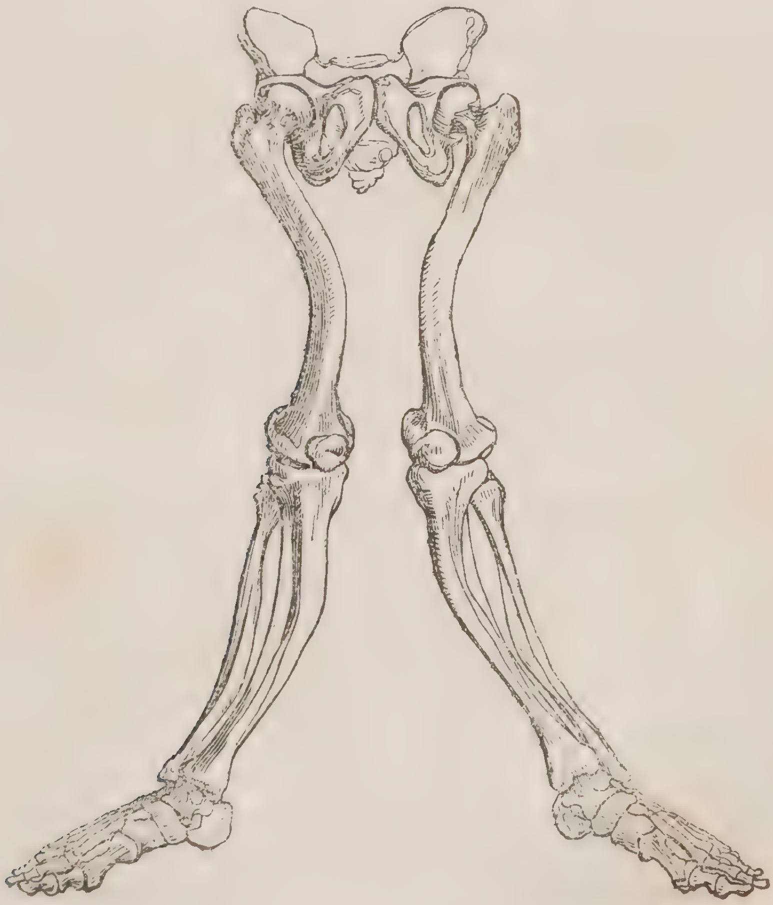
* [Rachitis is emphatically a disease of infancy, being most frequently witnessed from the eighteenth to the twentieth month; it is occasionally congenital, and sometimes, though rarely, it takes place after puberty. Of three hundred and forty-six cases examined by Mons. Guerin, of Paris,[a] three occurred before birth, ninety-eight during the first year, one hundred and seventy-six during the second, thirty-five during the third year, nineteen during the fourth, ten during the fifth year, and five from the sixth to the twelfth. Of these cases one hundred and ninety-eight were observed in the female sex, the remainder, or less than one-half, in the male. — Ed.]

[a] Memoir on the General Characters of Rachitis, translated by Dr. T. W. Colescott, of Louisville, and published in the Western Journal of Medicine and Surgery, for January, 1841.

Softening of the bones is met with at all ages, and in different degrees. It seems sometimes to be congenital, and combined with hydrocephalus. It often follows dentition, measles, hooping-cough, or other infantile diseases inducing debility. In females it seems to be produced, or at least often accompanied, by the debilitating effects of leucorrhœa, miscarriages, and floodings. Loss of blood, in any way, predisposes to it. Mercury, given in immoderate quantities, produces a softening of the bones; and, in some most remarkable instances on record, the free use of common salt was the only cause assigned. When the disease affects children, all the bones generally suffer, those of the extremities as well as those of the trunk; the limbs become bent in an extraordinary manner, and the heads of the bones are swollen, and appear to be much more so in consequence of the wasted and flabby state of the muscles. The child walks with diffi-



culty, and in many cases the legs are utterly incapable of supporting the weight of the body, so that he cannot remain in the erect position. The chest and pelvis become deformed, breathing is oppressed, the digestive organs are deranged, and the belly is tumid. The bones of the limbs become flattened as well as bent, and in their concavities, as remarked in the preceding cut, new bone is effused, in order that the column of support may be thereby strengthened. The new deposit is of extremely dense consistence, and is effused in greater or less quantity, according to the degree of curvature.

The bones of rickety subjects are soft, cellular, and of a brown colour, contain a dark fluid, and are very deficient in earthy matter. As a simple proof of the latter circumstance, it may be mentioned that distortions of the pelvis can be, and often are, accurately imitated by soaking the bones for some time in acid, whereby the earthy matter is extracted. In many instances this component of the bones is almost entirely removed, and soft matter deposited instead; they then consist merely of an extremely thin external osseous shell, covered by thickened periosteum, and containing a pulpy substance resembling fatty matter. During the progress of the disease, the urine deposits, often in great quantity, a white sediment, which, on analysis, is found to be the phosphate of lime. In rickets the head is generally enlarged to a greater or less degree, and the bones of the cranium are thickened and spongy; not unfrequently the intellectual faculties remain acute. In adolescents and adults the limbs seldom become affected; the bones composing the spinal column are the seat of the disease, and, along with the distortion of the spine, the position of the ribs is necessarily altered. Certain rare cases have occurred, in which all the bones of the adult were softened to a very great degree. In one remarkable instance, the patient complained of an annoying sense of tightness in the limb most affected, and, on examination, the softened bone was found greatly depressed at that point, as if a strong ligature had been drawn tightly round it. Mr. Howship, who attended the patient, was so kind as to present me some years ago with a portion of the altered femur, which consists of a fatty-looking substance, and appears to contain little or no earthy matter.*

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* [The symptoms which characterize this affection are generally well defined. The face has a yellowish, sallow appearance; the eyes are large and brilliant; the nostrils unnaturally expanded; the lips, especially the upper, tumid and everted; the head big, and sunk between the shoulders; the chest narrow and contracted; the curvature of the clavicle increased; the articular extremities of the bones unusually prominent; the muscles thin and flabby; the motions constrained and difficult; the whole body has a short, stunted appearance, and the little patient exhibits all the marks of premature decay or old age. The respiration, short and laborious, is performed chiefly by the diaphragm; the abdomen is tense and tumid; and the skin, which is constantly moist, is often bathed during the night with acid perspiration. The appetite is weak, the digestion difficult, the thirst considerable, and there is nearly always diarrhœa, or diarrhœa

Though incurvation of the spine occurs in boys, and even in adults, still it is most frequently met with in young females; and in them it is often induced by their having assumed a bad habit by sitting long in one constrained and awkward posture, as in writing or drawing, without, perhaps, the bones being unnaturally soft in the first instance. It often follows affections of the lower limbs, as of the knee or hip-joint; and is also caused by shortening of a limb, which has been negligently or ineffectually treated after fracture during child-

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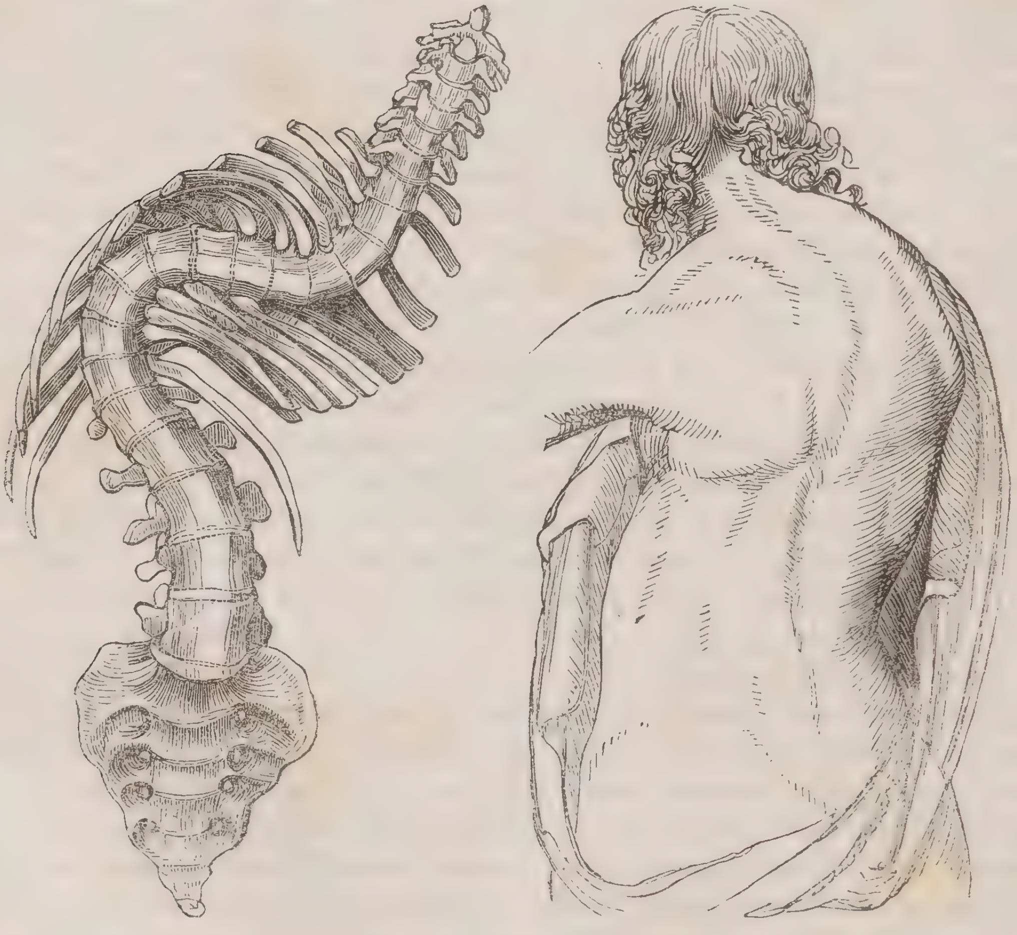
alternating with constipation. The alvine evacuations are of a thin, watery character; the urine is copious, but not high coloured; the pulse is small and frequent; the action of the heart feeble, the sensibility remarkably keen, and the mind uncommonly active. The child feels averse to use his limbs, and the bones are so soft as to be bent with the greatest facility.

The alterations of the osseous tissue have been divided by Mons. Guerin, to whom we are indebted for the most able and elaborate account of this disease that has yet been furnished, into three stages. In the first, the bones seem to be saturated with a reddish, watery fluid; a considerable quantity of which is also interposed between their outer surface and the periosteum, on the one hand, and between the medullary membrane and their internal walls, on the other. At a more advanced period, this fluid is replaced by a sort of gelatiniform substance, that is particularly conspicuous in the situations here specified, becomes gradually organized and vascular, and ultimately adheres with great firmness to the parts with which it lies in contact. The periosteum is thickened and injected, the nutrient vessels are remarkably enlarged, and the medullary membrane is sensibly altered in its character; the changes which it has undergone being similar, though less in degree, to those of the fibrous envelope just mentioned. The lamellæ of the long bones, naturally so hard and compact, are a good deal softened, and the areolar structure greatly rarefied, many of the cells being more than double or even triple the natural size. Similar alterations are observed in the short and flat bones.

In the second stage, a peculiar spongoid substance is formed between the periosteum and the outer surface of the bones, varying from two to three lines, or upwards in thickness; and which, by the pressure which it exerts upon the lamellæ of the compact tissue, sometimes forces them inwards upon the medullary canal, thus greatly reducing it in size, or even entirely obliterating it. Simultaneously with these changes the bones are rendered so soft that they may be easily bent, cut, or even indented with the finger. In the third stage — that of resolution — the recently formed substance in the long bones, as well as in some of the flat and short, assumes a compact character, and becomes gradually identified with the preexisting tissues, which at the same time regain their primitive solidity. Owing to the presence of this new matter, the bones are much larger than in the natural state, and their firmness — especially in the adult — resembles that of ivory. Hence the term *eburnation* is sometimes applied to this state of the skeleton. — Ed.]

hood, or by the patient being allowed to continue a custom of standing awkwardly on one leg. In a very remarkable specimen in my possession, the curvature seems to have resulted from the tremendous enlargement and consequent weight of the head. The whole skeleton (head, thorax, pelvis, and extremities) is deformed, flattened, and twisted. This may have arisen more readily in consequence of the atrophy of the bones, and retardation of their growth, produced by the long confinement to bed. The number of ossa triquetra in the lambdoidal suture was unusually great. The patient attained the age of twenty-five. The affection commenced from birth.

At first, during slight curvature from such causes, the spine can be brought into its original straight position by the voluntary action of its muscles. After some time, however, the curve cannot be remedied by any effort; interstitial absorption of the bodies of the vertebræ towards the concavity of the curve occurs; they become changed in form, and accommodated to their altered position, as shown in the accompanying sketch; the muscles also accommodate themselves to the new position, as do also the various ligaments connected with the spinal column. When the curvature is seated in the dorsal vertebræ it is generally to the right side; this shoulder is raised, and the chest is protruded, whilst the opposite side is depressed and flattened. The clothes hang loose, or fall off on the left side — the patient rests the weight of his body chiefly on the left leg — on stooping the right



scapula projects, and, on examination, is found to be nearer to the spinous processes of the vertebræ than the left. The left cavity of the chest is diminished, and the ribs press upon the heart and lungs, causing difficulty of breathing. To preserve the balance of the body, a curvature occurs below the former, and in the opposite direction; and not unfrequently there is a third incurvation situated above the primary one.

The bones of the pelvis become distorted, and are twisted to one side; or, when the softening is great, and the patient confined to the recumbent position, the introitus of the cavity becomes diminished in the antero-posterior diameter; and, if the patient walk about, the ossa pubis are squeezed together, in consequence of the pressure of the ossa femora against the acetabula. The crests of the ilia are often bent inwards, in consequence of the pressure of steel apparatus injudiciously applied with a view of removing deformity. When the bones become consolidated after such distortion, they present most serious obstacles to parturition; and, most unfortunately, crooked and deformed women possess, it is said, "great aptitude for conception." When, in such females, the untoward circumstance of pregnancy has occurred, it has been necessary, in some, to have recourse to the Cæsarean operation, and others have been delivered with the greatest difficulty and danger; notwithstanding which, many of these latter have, after recovering from a long and tedious illness, again become pregnant.

In some cases the softened ribs not only compress the organs of the chest, but are also pressed down upon the abdominal viscera, or even into the pelvis. The symptoms arising from such displacement are at first urgent, as can readily be imagined, and are often treated as inflammatory, to the detriment of the patient.

After some time, as the state of the patient's health improves, the bones in some degree regain their original firmness, and the curvatures are rendered permanent. New bone is deposited in the concavity of the curve, at first in irregular masses, but afterwards becoming condensed, and assuming a more regular form, the column is thereby supported and strengthened.

Bending of the spine backward, with depression of the spinous processes, is extremely rare. But curvature forward, with projection of these processes, is by no means uncommon, and is generally supposed to be caused by caries of the bodies of the vertebræ; in many instances, however, it arises from interstitial absorption only.

Curvature from caries of the vertebræ, though not so frequent as the curvature from other causes, is met with pretty often. In adults, the curvature from ulcerative absorption is more common than that from softening of the bones. It is attended with the formation of purulent matter, which presents in the loins, at the top of the thigh, or near the anus; the bones may become affected secondarily, though much less frequently, in consequence of the formation and accumulation of purulent matter in their neighbourhood. There is pain in the loins; the patient walks in a stooping posture, and often complains of pain in the knee or thigh. The lower limbs sometimes become paralytic, as also the sphincters and extremities of the hollow viscera;

this, however, may arise, without curvature, from softening of, or effusion on, the chord, or diseased thickening of its membranes. In some cases the palsy supervenes slowly; at first the patient has an awkward gait; he lifts his feet high to avoid stumbling, and afterwards puts them down clumsily and suddenly; the foot, in some cases, is extended, so that the patient is unable to plant the sole on the ground. Retention of urine occurs, and is followed by incontinence, with copious deposits.

In the *treatment* of Rachitis, the chief indication to be fulfilled is to support and increase the powers of the system; and this may be accomplished by affording the patient a generous diet, keeping the bowels in good order, enjoining gentle exercise and exposure to pure air, by the assiduous use of frictions, and by supporting the softened bones by properly applied and light machinery. Much mischief may be done by clumsy and heavy apparatus which confine the movements of the patient; the muscles are wasted, consequently the spinal column is weakened, the general health is impaired, and the disease is aggravated. Some have recommended the internal administration of the phosphate and muriate of lime, but their efficacy is extremely doubtful. Preparations of iron seem to answer much better in the greater number of cases. In cases of curved spine, apparently arising from bad habit, the patient should be in no degree confined at writing, or drawing, or music; her posture while at work or play ought to be attended to, as well as her mode of walking or standing; and, if awkward, prohibited. Gymnastic exercises of the more gentle kinds ought to be enjoined, such as those with poles and light wooden clubs, the turning of a wheel, the exercise with balls, &c. Carrying weights on the head can only be applicable in certain cases. The shoulders, in some instances, ought to be kept back by means of a light back-board; and in aggravated cases the weight of the shoulders, and sometimes also of the head, must be taken off the spine by a light and well-contrived apparatus. Sea-bathing, good air, out-of-door exercise, and attention to diet, are of material importance. Frequently advantage will result from the patient's sleeping on a hard mattress; and, in bad cases, from lying down, when tired, on an inclined plane.

In great softening, it will be necessary to confine the patient entirely to the recumbent position, and to support the head and shoulders by a light and firm machine. The causes, symptoms, appearances, and treatment of caries of the spine, in its different regions, with or without curvature, will be afterwards considered.

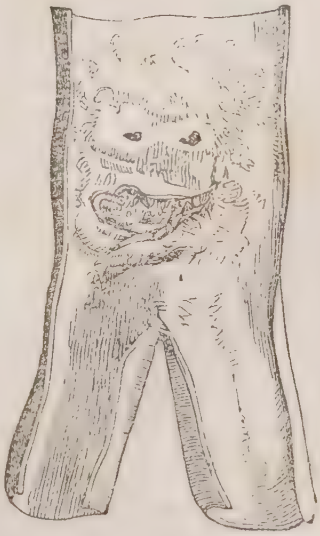
OF INFLAMMATORY AND OTHER AFFECTIONS OF THE ARTERIAL SYSTEM.

During inflammation of arteries, the actions of the vessels are accelerated and attended with pain; the internal coat is found to be of a red colour, from increase of its vascularity, and not from its being merely tinged with the colouring part of the blood; or it is of a yellowish hue and rough, from the deposition of lymph on its surface, whilst the external coat is thickened by the infiltration of serum and lymph. When bloodvessels are inflamed from mechanical irritation, lymph is secreted on their internal coat, becomes organised, and obliterates their calibre; if deficient in nervous influence and circulating fluid at a particular point, there ulceration of their coats occurs; if violently injured or completely isolated, their coats mortify; and these circumstances must all be calculated on in the surgical treatment of arteries. A universal inflammatory state of the arterial coats is said to have existed, and its symptoms have been minutely detailed; but its occurrence seems to be extremely rare, and the treatment is medical.

Inflammation is supposed to precede degeneration of the arterial coats. As a person advances in life the arteries lose elasticity, and the heart its balance with them; either the one or the other becomes dilated, their parietes are thickened, and the valves are altered in structure; the enlargement of the vessels is generally greatest towards their origin. The dilatation of arteries, more especially of the internal ones, is often very great; ultimately the internal coat gives way, and the external, with the surrounding tissues, yields in proportion as the blood diffuses itself. The internal tunic is occasionally burst in consequence of violent and sudden muscular exertion; and, even when the vessels are pretty limber and sound, effusion of lymph, and obliteration of the vessel ensue, or, more frequently, aneurism.

Previously to the rupture of the internal tunic, however, there is, in most cases, a morbid alteration in the texture of the vessel. The internal coat becomes dry; its textures is more dense and less elastic, and consequently more brittle. Morbid matter is deposited between the middle and internal coats, and this, by stretching the latter still further, diminishes the elasticity and cohesion of their texture. The deposit is at first to a slight extent and of soft consistence, somewhat resembling condensed fatty matter. Afterwards it increases in quantity and consistence, becoming, instead of soft and yielding, dense, hard, and incompressible; in short, calcareous.

Though the morbid deposit is at first confined, as above related, its limits are afterwards extended; calcareous matter is insinuated, either in minute particles or in broad laminæ, amongst the fibres of the middle coat, is also found external to it, and occasionally situated in the cellular coat. In fine, the various component parts of the parietes of the vessel degenerate, according to the degree of advancement which the disease has attained; and such a condition is the predisposing cause to ulceration of the internal coat, and subsequent effusion of blood. The steatomatous, ulcerated, earthy degeneration of the proper coats of an artery, as Scarpa, the celebrated professor of Pavia, has it, are well exhibited in the accompanying sketch.



During violent and sudden exertions

the more brittle parts may burst, either at a certain point, or throughout the whole circumference of the artery; and on this such results will supervene as on ulceration of the internal tunic. Ecchymosis then takes place under the cellular coat, which becomes thickened, and incorporated with, and strengthened by, the surrounding tissues; this is the incipient state of an aneurismal tumour. The effusion of blood, gradually increasing, distends the cellular coat, forming the cavity into which it is poured, and produces a tumour of a size proportional to the distensibility of the tunic and the force of the effusion. Sometimes the external coat is separated from the others to a considerable extent by the insinuation of blood. An aneurism, however, may exist from simple dilatation of a portion of the vessel, gradually increasing, and forming a cavity in which the blood accumulates. At one time it was supposed that all spontaneous aneurisms were caused by simple dilatation of the canal; but such an opinion has been long shown to be incorrect, and the term of true aneurism is now confined by many to that tumour and accumulation of blood consequent on the giving way of the internal coat, and situated externally to the canal of the artery. It is true that dilatation may occur previously to the giving way of the coats, and thus the two causes are combined. The dilatation occurs from the calibre of the artery being considerably diminished, in the first instance, at the point where its coats have undergone the calcareous degeneration, and only acts as a predisposing cause to the failure of the coats when thus diseased. When there is mere dilatation, the tumour is generally of an oval form; but when the internal coat gives way, a lateral prominence is formed, and gradually increases in size. The shape of the true aneurism is various: sometimes the tumour is globular, with a narrow neck; and, from this being of considerable length, it becomes difficult, in some situations, as above the clavicle, to ascertain the particular artery which is the seat of disease, the globular extremity of the tumour presenting itself at some distance from the vessel with which its pedicle is connected. This is rare, however. At other times its form is very irregular, being most prominent at the part where the accumulation of the blood is least resisted. Pulsation in the tumour is distinct from the first, and is painful to the patient; and in the external aneurisms it is so strong as to be perceived by a bystander at a considerable distance. The tumour is at first compressible, and completely disappears on firm pressure being applied, either directly to the sac, or to the artery above, the sac being thereby emptied of its contents, or prevented from being filled. It may sometimes be difficult to form an accurate diagnosis, from the circumstance that tumours, not aneurismal, receive a pulsatory movement from an artery or from arteries immediately beneath them; such difficulty is obviated by attention to this simple test—that in an aneurism the pulsation is felt equally in all directions. Besides, if the tumour is moveable, it can be partially displaced, so as not to lie immediately over a large artery, and, if it be not aneurismal, it will then be found to possess no pulsation; if it be an aneurism, its pulsation will not be diminished by any change of position.

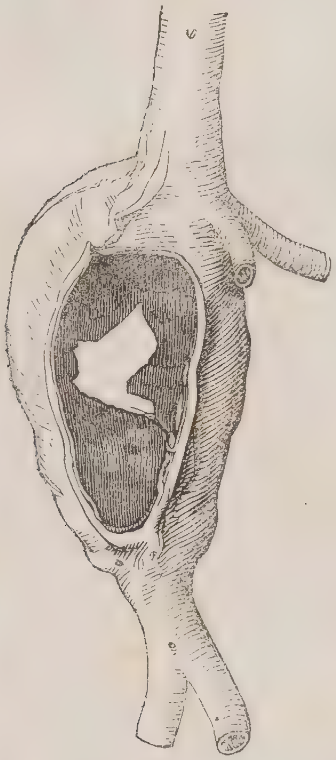
The blood contained within the aneurismal sac, being comparatively motionless, coagulates, and the coagulum is attached to the inner surface; at first it contains red globules, but it afterwards loses them, and becomes of a pale hue, consisting solely of fibrin. This coating gradually increases, and attains no small thickness, fresh portions of fibrin being superadded in concentric laminæ. These layers are chiefly deposited from the blood within the cavity, but they also appear to receive addition from lymph being effused by the vessels proper to the original parietes of the tumour. By such thickening, it can be easily conceived that the pulsation will be somewhat lessened. In large aneurisms the accumulation and deposit of fibrin may be much greater at some points than at others, and hence pulsation may be rendered "not equal in all directions." It is not, however, diminished to any great extent; for absorption of one or more points occurs, and the coating is again attenuated.

In some rare cases the deposition of fibrin has gone on gradually accumulating, filled completely the aneurismal cavity, and thus effected a spontaneous cure, the remaining solid tumour imperceptibly diminishing by the action of the absorbents. After obliteration of the aneurismal cavity, the fibrin is generally deposited in so great quantity as to occupy the calibre of the vessel above and below the tumour, obstructing the progress of the blood, causing it to flow by the smaller and collateral branches, and effecting a spontaneous cure, somewhat similar to that produced by the artificial application of a ligature. Coagula are seldom formed in the dilated vessel, to whatever size it may be enlarged, unless there is fissure of the internal coat; for in no other way can a portion of the blood readily become stagnant, while the calibre of the vessel remains pervious. There is in my collection a preparation of dilated aorta, to the coats of which adheres a large firm coagulum. Occasionally, though rarely, a dilatation of the internal coats is met with accompanied by thinning of the external ones. Of this sort of diverticulum, there is also a good specimen in the collection here alluded to.

A spontaneous cure may also be accomplished from the original aneurism being compressed by one of a more recent origin, causing ultimate obliteration of the canal. Of this I recollect one remarkable instance; the patient was afflicted with an aneurism of the axillary artery, which had attained a large size, and the cure for the disease in this situation being then unknown or unattempted, the patient was considered as lost; but some time after the tumour began to diminish, and disappeared. The patient died; and the cause of death was found to be the giving way of an aneurismal tumour of the arteria anonyma, which was situated so closely to the aneurism of the subclavian as to have acted as a mechanical compress, causing obliteration of the vessel at that point.

When a cure has been effected, the vessel is found to be converted into a dense and impervious cord at the site of the tumour. The canal above is dilated; the coats are thickened, especially the middle; and from the thickening and increased action of the fibres, the internal coat becomes somewhat rugous, the rugæ being in a transverse direction.

The aneurismal tumour in general increases, and approaches the surface, involving and destroying all the intervening textures. If resisted in its enlargement by bone, even this is not sufficient to impede its progress; the bone is absorbed, and perhaps ulcerated, at the point where it is compressed by the tumour. The osseous is more liable to destruction from this cause than the cartilaginous tissue, contrary to what occurs from compression by abscess. Ultimately the sac gives way, and its contents are discharged either externally, or into an internal cavity or canal, in consequence of its parietes sloughing from the compression made by the tumour; and such termination is instantly fatal.



An aneurism of the descending aorta, in a great measure one from dilatation, is here represented: the patient also laboured under popliteal aneurism of one limb, and inguinal of the other. He died suddenly, in consequence of the giving way of the internal tumour. The escape of blood into the cellular tissue may even take place to such an extent as to prove fatal in a few hours. The disease may also prove fatal by mere compression, as of the trachea, impeding breathing, and inducing disease of the respiratory organs; or by pressure on the gullet preventing the passage of food: in the latter case, however, the dissolution is generally more sudden, in consequence of the compressing part of the tumour giving way, and the contents being evacuated into the stomach or mouth. If the aneurism compress a plexus of nerves, or the spinal chord itself, the anterior part of the vertebræ having been previously absorbed, paralysis is produced.

In consequence of aneurism, the circulation of blood in the vessel is obstructed; hence the collateral branches above the tumour become enlarged, and through them the circulation is continued; by their anastomosis with collateral branches which arise below the seat of the tumour, a portion of the fluid is brought back into the canal of the original artery. The circumstance of collateral enlargement used to be distinctly enough demonstrated in amputation, one of the old cures for the disease.

The tumour may be suddenly increased by a portion of the parietes giving way, and the blood being propelled into the cellular tissue, which becomes thereby condensed, and supplies the deficiency in the original sac; diffuse is thus superadded to the true or encysted aneurism.

The disease is generally accompanied with great pain, the neighbouring nerves being much stretched by the enlargement of the tumour, as in the axilla or ham; in these situations also the limb below the aneurism is much swollen from the compression of the absorbents and veins and consequent infiltration into the cellular tissue. Diffused aneurism from wounds, and the other species of the disease, will be afterwards treated of.

The peculiar degeneration of the coats of the vessels has been already stated to be the predisposing cause of aneurism; and the disease may be directly caused by over-excitement of the circulation, or by an over-exertion of the muscles. It is more frequent in males than females.* In men somewhat advanced in life the arteries get hard and rigid, whilst at the same time the muscles are strong, the general health good, and the whole frame stout and active; so that the patient is capable of violent muscular action, such as the arteries are ill able to bear, and consequently the internal coat of a vessel yields, and lays the foundation for an aneurism.† The lower limbs being chiefly subject to such exertions, aneurism in them is most frequent;‡ and for the same reason it is said to be common in those who

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* [Of sixty-three cases recorded by Mr. Hodgson, in his work on the Diseases of the Arteries, fifty-six were noticed in the male, and seven only in the female. The reason of the more frequent occurrence of aneurism in men than in women is found in the circumstance of the former being more exposed to all sorts of violence and disease than the latter. — Ed.]

† [This disease is much more frequent in old than in young persons. Of one hundred and eight cases, collected by Dr. Bizot, of Geneva, from the writings of Morgagni, Corvisart, Laennec, Scarpa, Boyer, Hodgson, Richard, and S. Cooper, only a single one occurred before the twentieth year. Fifteen were noticed from the age of twenty to twenty-nine; thirty-five, from thirty to thirty-nine; thirty-one, from forty to forty-nine; fourteen, from fifty to fifty-nine; eight, from sixty to sixty-nine; two, from seventy to seventy-nine; and two, from eighty to eighty-nine. Thus it would appear that more persons suffer from this malady from the age of thirty to fifty than during all the other periods of life put together. (*Elem. of Path. Anat.* vol. i., p. 288.)—Ed.]

‡ [The following table, extracted from the Cyclopædia of Practical Surgery, will place this subject in a clearer and more accurate point of view. It exhibits the relative frequency of spontaneous aneurism in the different arteries in 179 cases, excluding those of the aorta: it was drawn up originally by Mons. Lisfranc:—

1.	Popliteal		59
2.	Femoral	at the groin	26
		at other points	18
3.	Carotid		17
4.	Subclavian		16
5.	Axillary in the arm-pit		14
6.	External iliac		5
7.	Innominata		4
8.	Brachial		3
9.	Common iliac		3
10.	Anterior tibial		3
11.	Gluteal		2
12.	Internal iliac		2
13.	Temporal		2
14.	Internal carotid		1
15.	Ulnar		1
16.	Fibular		1
17.	Radial		1
18.	Palmar		1

In another table, constructed by Mr. Hodgson, and founded upon ride much on horseback. Degeneration of the coats of the vessels in the superior extremity is extremely rare. This is another reason why spontaneous aneurism seldom assails them.

Treatment.—In internal aneurism the only indication which can be followed, with any chance of success, is to favour the occurrence of a spontaneous cure, by abstracting all stimuli, mental and corporeal, by enjoining complete rest, by keeping the patient on low diet, and by repeated bleeding. Thus the force of the circulation is diminished, and coagulation, it is said, promoted; by this practice aneurisms, the progress of which defies external means, are occasionally, though very rarely, cured. Ice and other cold applications to external aneurisms, or those which have made their way to the surface, have been recommended to induce coagulation, but their use is not unattended with danger; for they may, in some stages, so far diminish the vitality of the coverings as to cause sloughing, and fatal hemorrhage.

In the treatment of aneurisms exterior to the great cavities, important improvements have been made in modern times. No success can be expected to follow palliative and temporizing measures, and a cure can result only from operation. Formerly it was the practice to lay open the aneurismal tumour, to search for the extremities of the artery opening into the cavity, and to secure them by a ligature, or close them by pressure, styptics, or both. In some few instances this method had permanent success; but in the majority the operation proved wholly abortive, and not unfrequently fatal. It was necessarily tedious in its performance, and attended with much danger, the blood being discharged in great profusion immediately after the opening of the sac, and the extremities of the vessels being with great difficulty detected and secured. Besides, the vessels in the immediate neighbourhood of the tumour having generally undergone the degeneration already mentioned, were incapable of taking on any healthy action; the application of ligature on a vessel thus circumstanced could consequently be productive of no advantage. From this method having almost invariably proved unsuccessful, practitioners in those days generally preferred amputation, when the tumour was so situated as to allow it; and when the disease occupied a situation in the limb so high as to prevent amputation, the case was deemed incurable, and the patient abandoned to his fate. But amputation was accompanied with circumstances almost equally alarming with those attendant on division of the sac: the hemorrhage was very great; for as a consequence of obstruction to the free passage of the blood in the aneurismal vessel, the circulation was chiefly carried on by the collateral anastomosing branches, which were there-

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sixty-three cases, including, however, twenty-nine of the aorta and innominata, the results are as follows:—

Carotid	2
Subclavian and axillary	5
Inguinal	12
Femoral and popliteal	15.—Ed.]

by so much enlarged, as, on their division, to pour out blood with a profusion resembling that of arteries of the second or third magnitude. Continued pressure was employed as a less hazardous method of cure, but was equally inefficacious; and was also attended with danger, from the risk of sloughing. If the practice ever proved successful, it was only after a tedious perseverance in its use, and long confinement of the patient.

The operation of applying a ligature on the vessel at a distance from the tumour, and thus intercepting or weakening the flow of blood into the cavity, so as to allow complete coagulation to take place, is of comparatively modern invention, and is the one now practised with almost invariable success. To John Hunter without doubt belongs the merit of proposing and putting it in practice; it has been claimed also for the celebrated Desault. This operation has been variously modified. Some have advocated the temporary application of a ligature, conceiving that the effects produced will be as complete and permanent when it has been allowed to remain only for a certain time, as when it is left undisturbed and ultimately separated by nature. Such a theory, however, has proved to be incorrect in most of the instances in which it has been reduced to practice on the human subject; and the operation is at best very uncertain, and not to be relied on. Others have employed a double ligature, and some of the Continental surgeons have applied a great many; some were tightened, others left loose, and looked upon as ligatures of reserve to be tightened, should hemorrhage take place, an occurrence likely enough to follow their clumsy and unsurgical proceedings. A thick broad ligature like tape has also been used, from an ill-grounded apprehension that all the coats of the artery would be cut completely through by the tight application of a thin and firm one. With the same view, a roll of linen or plaster has been interposed betwixt the noose and the vessel, and this practice has been advocated even by good surgeons — as Scarpa. Such complications can do no good, and may do much mischief. The artery must be greatly detached from its surrounding connections before the numerous and flat ligatures can be applied, in consequence of which its coats will be apt to slough or ulcerate, and hemorrhage occur. When, from any cause, the vessel has been detached to a greater extent than is sufficient for the passing of one ligature, two ought undoubtedly to be used, and one applied close to each extremity where it is attached to the surrounding parts.

Again, it has been proposed, after the application of a double ligature, that the vessel should be cut through betwixt the two deligated points; it being supposed that in this way the closure of each extremity will be more rapid, the cut ends retracting, and being, in fact, in the same circumstances as the extremities of arteries which have been tied on the face of a stump. Mechanical contrivances have also been invented for the compression of the artery, — such as the serrenœud and presse artere; these, however, are clumsy, insufficient, and often injurious.

The single ligature, when properly applied, is the most safe, and preferable to any other, for arresting permanently the flow of blood in a vessel. In its application, the artery must not be separated from its connexions farther than is barely sufficient for the passage of the armed needle beneath it; but the external incision ought to be free, in order that this may be readily effected, and that the operation may be easily and speedily performed. By the firm application of a single ligature, the vessel is rendered impervious; the internal and middle coats are divided, so that the ligature only encircles the outer or cellular one, which resists the influence of any moderate degree of force by which it may be tightened. The blood coagulates above the deligated point, — the coagulum is of greater or less extent, in proportion to the vicinity of a collateral branch, and is of a conical form, the apex of the cone pointing to the free portion of vessel. Incited action in the vessel takes place at the deligated point; the divided margins of the internal and middle coats secrete lymph, by which they adhere, and so obliterate the canal of the artery. Lymph is also effused on the external surface, and in this deposit the ligature becomes imbedded. The direct influx of blood into the aneurismal sac is thus intercepted, and time is allowed for coagulation of the blood which it contains; the artery for a considerable distance below the ligature becomes ultimately converted into a firm and impervious chord. The coats of the vessel above the ligature are much thickened, and the internal membrane is occupied with the transverse rugæ occasioned by projecting fasciculi of the fibres, which are always apparent after obstruction of an artery. If this operation be properly conducted, success must almost uniformly follow. Before determining on its performance, however, the state of the arterial system ought to be examined as carefully as possible; for not unfrequently the degeneration of the coats is almost universal, and therefore an artery, or even arteries, may be diseased at more points than one; and if this aneurismal diathesis exist, the patient may be found to labour under an internal aneurism of the aorta. In such a case, an operation could not with propriety be undertaken for the cure of the external aneurism; there might be no inconsiderable danger of the patient's death being suddenly accelerated by the operation, the sac of the internal aneurism giving way perhaps during its performance: such a circumstance has actually occurred.

Ligatures composed of animal substance, such as catgut, have been proposed as preferable to all others, on the supposition that they would be absorbed, and occasion less irritation; the fallacy of any such theory has already been adverted to. After the ligature has been applied for some time, it induces ulceration of the external coat which it envelopes, by which means it becomes detached from the vessel; acting as a foreign body, and causing a slight degree of suppuration, it makes its way by nature to the surface and is discharged. The period at which it separates may be said to be from the tenth to the twentieth day; sometimes sooner, seldom later. If, however, much of the surrounding parts have been extensively included along with the vessel, a longer period will probably elapse before the separation of the ligature. One end only of the ligature should be cut away close to the artery, the other being left hanging from the external wound; perhaps it is even safer to leave both, unless a third knot is made upon it; thus the extraneous body, when detached, can be gently pulled at so as to hasten the separation: this must be done with very great caution. When both ends are cut short, and the knot closed in, there is a risk of secondary hemorrhage, from the ligature causing formation of matter round it, perhaps detaching the vessel from its connections, and causing ulceration of its coats.

The operation ought to be performed at as early a period of the disease as possible. Some recommend that it should be delayed in recent cases, with the view of allowing sufficient time for the anastomosing vessels to enlarge, in order that the circulation may be more vigorous in the smaller branches after obstruction of the principal vessel. Such delay prolongs the patient's sufferings, which are in many cases extremely acute, and the precaution is altogether unnecessary, as has been amply proved by experience. On the same principle, the previous application of pressure to the vessel has been recommended; but few surgeons, if any, are now afraid of trusting to the resources of Nature when the principal vessel of a limb is obliterated, and that suddenly, without previous dilatation of the anastomoses. Cases are on record, in which the abdominal aorta has been completely obstructed by a natural process, without much impeding the inferior circulation; and in one remarkable instance of this desrciption, the inconvenience was so slight that the disease was not suspected during the life of the patient, the lower limbs retaining their usual size and activity. In plethoric habits it may sometimes be prudent to abstract blood, even more than once, previously to the operation.

When the ligature is placed immediately below a collateral branch of considerable size, a bloody coagulum is not formed, though adhesion may occur; but if the excited action should extend to the collateral branch, and its canal become thereby obliterated, a coagulum is speedily deposited. In consequence of the enlargement of the anastomosing branches, and the increasing circulation in them, pulsation generally returns in the tumour, to a slight degree, some days after the operation. This, however, is by no means a sign that the operation has been ineffectual; for the renewed pulsation almost always disappears in the course of a very short time. In one instance only have I found it assume a more permanent and troublesome aspect; in that case, it recurred about ten months after the performance of the operation, but speedily disappeared under the careful use of a compress and bandage.

On account of the aneurismal diathesis, it occasionally happens, that after the cure of one aneurism, another appears in a different situation; in two instances, I operated on both thighs, at a considerable interval, successively and successfully, for popliteal aneurism, in the same patients.*

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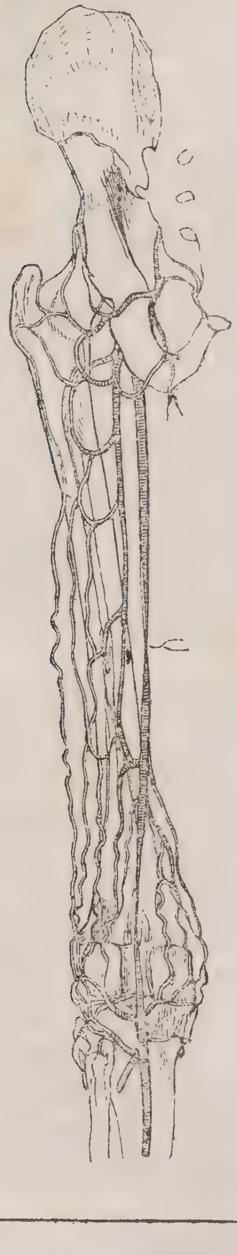
* [This aneurismal diathesis occasionally exists in an astonishing degree. Thus, Pelletan relates an example in which there were upwards of sixty tumours of this kind; and a still more remarkable one is recorded by Mons. J. Cloquet. In this case the number of dilatations exceeded two hundred, the largest of which were not bigger than a

When the tumour is so situated as not to admit of the application of a ligature between it and the heart, it has been proposed to place the ligature on the distal side of the aneurism, upon the supposition that coagulation will occur within the sac in this case as after the common operation.* The practice has been made trial of, but its expediency appears very doubtful; neither has the success attendant upon it been such as is generally supposed: the *post mortem* examinations have been very unsatisfactory in some of the cases. The application, indeed, of a ligature in that situation can seldom be of any advantage, the artery being already obliterated, in aneurisms of some standing, a long way beneath the tumour; and it is, perhaps, from this circumstance that, in such operations, great difficulty has been experienced in securing the vessel, and that it has been thought necessary even to pass a needle under a thick mass, somewhat in the situation of the artery. It would appear, in some instances, that the artery when pervious had even remained untouched, not being even exposed by the burrowing process employed by some of the operators; and that if any vessel was tied, it was not the trunk in which the disease existed. It would appear that a very correct diagnosis had not been formed in some of the cases.



The appearance of the vessel after the application of a ligature above the tumour has been already shown. The obliteration of the sac proceeds, in some cases, very rapidly; it assumes a harder feel, decreases, and disappears; being connected with the vessel by means of a dense impervious chord, to which condition that portion of the artery has been reduced. The anastomosing vessels enlarge more and more, carry blood freely from above to below the ligature, and thence to below the tumour; some even passing to the latter situation directly from above the ligature. Along with the muscular and other

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common pea. (*Elements of Path. Anat.*, vol. i., p. 283.) An instance similar to that in the text occurred at Cincinnati two years ago, in a man between thirty and forty years of age, in whom Professor Mussey secured the right femoral artery for popliteal aneurism. Three years previously the same operation was performed on the left limb for the same affection by Dr. Speer, of Pittsburgh. — Ed.]

* [This is commonly called Brasdor's operation, after the surgeon who devised it. Mr. Wardrop, of London, is its greatest advocate. It has proved successful only in a few cases out of upwards of twenty in which it has been performed. — Ed.]

branches, the neurilemmal vessels also become enlarged, and compress the nervous filaments; and to this are to be attributed the annoying pains which sometimes occur in a limb after the operation for aneurism. The enlargement of the arteries of the neurilemma can be distinctly shown by dissection.

Immediately after the operation, the circulation in the limb cannot be so vigorous as before; its temperature is consequently diminished, and it possesses less power of resisting the influence of stimuli. The limb ought to be kept only moderately warm; for if too much heat be applied, there is a risk of gangrene. The temperature afterwards rises, and soon gets above the natural standard; the blood, from obstruction in the internal parts, being chiefly determined to the surface. After the collateral circulation has been completely established, the limb regains its natural temperature.

Secondary hemorrhage is occasionally a consequence of this operation; nor is it to be wondered at, should one ligature only be used, seeing that this is often clumsily applied; the cellular tissue being lacerated, and the vessel detached from its connections by the use of blunt instruments, directors, and silver knives. When many ligatures are employed and foreign substances placed in the wound, the patient can scarcely be expected to escape profuse bleeding. If, however, the operation by single ligature be properly performed, and the coats of the artery be sound at the deligated point, the occurrence of secondary hemorrhage must be rare. It generally supervenes when the ligature is about to separate: at first there is a thin bloody discharge, afterwards the quantity of blood is more copious; it is evacuated at first in a gentle and continued stream, but afterwards *per saltum*, and in profusion. The discharge not unfrequently stops for a short time, but, on the circulation being excited, it again returns; and the patient soon dies, unless active measures be practicable, and immediately resorted to. Compression can be of no use; nor can astringents, nor venesection, which I have actually seen practised in such cases. The application of a ligature betwixt the heart and the open point of the vessel affords the only chance of saving the patient; the surgeon must interfere, and do what is in his power — he cannot look on and see the patient bleed to death.

Occasionally the aneurismal sac deviates from its usual structure and appearance. Sometimes osseous or calcareous matter is found deposited, to a greater or less extent, in the substance of the parietes of the sac, or between the laminæ of fibrin which it contains. The tumour may also occupy unexpected situations, occurring after fracture of the bones and laceration of an artery, and perhaps from more slight external injuries. A disease of bone, somewhat resembling aneurism in that tissue, will be afterwards noticed.

OF ANEURISM BY ANASTOMOSIS.

This disease is generally seated in the external cellular tissue. It has been supposed to attack occasionally the internal organs; and a case is related in which it was situated in the cellular tissue, between the vagina and rectum. Frequently the congenital marks of children, termed Nævi, degenerate into this disease: occasionally, though very rarely, it occurs in sound skin and in adults. A good case of this kind will be found in the *Practical Surgery*, p. 336. When the cutaneous tissue is involved, the colour of the tumour is a dark red, or inclining to purple; it is irregular on its surface, and has a soft, spongy feel. Often it is raised distinctly above the surrounding parts; at other times it is flat, scarcely prominent, and seems to enlarge chiefly in a lateral direction. The skin is then frequently unaffected; pulsation, in some instances, is perceived; often, however, the tumour is of an inactive character, affords no pulsation, and, on being handled, feels like a doughy, elastic intumescence, appearing to be composed of a congeries of distended vessels, in which the blood circulates slowly, and resembling varix. The tumour is formed by enlargement, tortuosity, and increased activity of the capillary and other vessels; in some cases the arteries are chiefly affected, in others the veins. That such is its structure, can be distinctly proved by dissection; the vessels are found enlarged to many times their natural size, and their coats are much attenuated; it is certainly not cellular, as some have supposed. The tissue is similar to that of the cavernous and spongy bodies of the penis, and has hence been named erectile. A natural structure of the same kind is met with in the lower animals in different situations. The tumour is much increased on the general circulation being hurried, as by crying in children, by fits of passion, by the excitement of ardent liquors or venery, and during or before the menstrual discharge. On such occasions the surface frequently gives way, hemorrhage ensues, and is often profuse; in females it sometimes takes the place of the regular discharges. The tumour, in general, increases rapidly in size, and bleeds from time to time; now and then, however, it becomes stationary, even in circumstances where it could hardly be expected, and remains so during the remainder of the patient's life. Again, in children, the surface of the tumour is not unfrequently ulcerated, even to a great extent, without hemorrhage occurring; when such is the case, the ulceration for the most part extends, with surrounding induration and condensation of the parts. The whole or part of the adventitious tissue may thus be destroyed; the parts cicatrise, and a spontaneous cure is sometimes accomplished. In other cases, though the disease is not extensive, frequent and most violent hemorrhage occurs. A hemorrhagic tendency also occasionally occurs in affections of a different nature,—a trifling sore pouring out blood on the slightest touch. In some constitutions, leech-bites, trifling punctures, or the extraction of a tooth, have been followed by dangerous hemorrhage. The disposition very often exists in many members of the same family, and is sometimes hereditary. Great trouble has been experienced in staying the bleeding; large vessels have been tied without effect, and some patients have even perished notwithstanding every exertion on the part of the attendants. It becomes a difficult matter to treat surgical diseases in such constitutions: openings cannot be made with the knife for the evacuation of matter or any other purpose. A good case will be found in the *Lancet*, 1838–39.* The same patient again presented himself with a very large and deep abscess of the hip, which was opened by caustic, though nearly one inch and a half from the surface. It is not easy to account for this disposition to bleed so profusely, or from slight causes. The blood is in a diseased state, probably as in the patient here referred to, in whom it contained pus globules, and coagulated slowly; there is probably also a want of tone in the vessels themselves. Many such cases are on record. The cause, or causes, of aneurism by anastomosis are also unknown.

In very slight cases of erectile tumour, or in nævus threatening to assume an aneurismal action, cold and pressure are sometimes, though very rarely indeed, sufficient for the prevention or removal of the disease. The most effectual remedy is excision, though this can very rarely indeed be had recourse to with safety; for when the disease is extensive, the vessels in its neighbourhood are much enlarged, and their action increased; so that any attempt to remove the tumour by the knife is followed by profuse, and often an uncontrollable, flow of blood. When excision is practicable, it ought to be accomplished by cutting very clear of the disease; the tumour, like every other, must be cut out, not cut into. If the incisions encroach on the substance of the tumour, or are made in the immediate neighbourhood of the diseased part, the tremendous bleeding which invariably ensues will convince the practitioner of the impropriety of his conduct, and rashness of the proceeding. Attempts have been made to arrest the progress of the diseased action, by tying the principal arterial trunks entering the tumour; but these have proved ineffectual, as might be expected, considering the unusually free and numerous inosculations which then exist. In a few instances, ligature of the carotid artery, on the same side with a tumour on the face or head, has put a stop to the disease; in the others, it has been unavailing.

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* [For some very interesting examples of this hemorrhagic tendency, the reader is referred to Mr. Wardrop's excellent little work on Bloodletting, and to the first volume of my Elements of Pathological Anatomy. A few years ago a case came under my notice in which fatal hemorrhage was caused by lancing the gums over the two central incisors of the upper-jaw, in a male child between five and six months old. He was labouring at the time under an attack of cholera, so prevalent in our early summer months; and the day after the operation purpuric spots appeared in different parts of the body, the largest being situated on the abdomen and the scalp, just behind the ear. The bleeding was at length arrested by the twisted suture, made by transfixing the gum with three very small needles, the points of which were broken off close to the jaw, and the threads applied in the usual manner. Notwithstanding this, the child died exhausted on the fifth day, hemorrhage having, in the meanwhile, taken place from the stomach and bowels. It may be proper to add, that the infant had been delicate from his birth, and that there was no hereditary predisposition to the singular affection which carried him off. — Ed.]

When the tumour is so situated, or of such a size, as to render the expediency of excision doubtful, it may often be safely and expeditiously removed by ligature. In some cases the tumour is prominent, so that it readily allows of the application of a ligature around its base; in others, it is flat and broad; in which case, a long needle, or needles, armed with a double ligature, can be passed beneath it, and the ligatures can then be separated, and so disposed as to cause sufficient constriction of the entire mass.—Vide *Practical Surgery*, p. 331, 336. In many cases, incisions may be made with great advantage, either before or after introducing the ligatures; the diseased mass is thus more effectually included and strangled, and much pain and deformity are avoided. The disease, however, occasionally occupies such situations as are totally beyond reach. The application of potass has been recommended; and this caustic is certainly sufficiently powerful to destroy the diseased parts; but its use is attended with danger from profuse hemorrhage. Superficial nævi may occasionally be got rid of by the application of nitric acid, but it requires to be applied over and over again; and, after all, some more effectual means must probably be resorted to. Stimulating injections into the substance of the growth have been sometimes employed. Cures, it is said, have followed the use of setons, or the repeated puncturing and breaking up of the tissue with a needle. None of these means are to be depended upon. The cases are innumerable in which I have been obliged to employ the ligature in an effectual manner, combined or not with incision, where caustics, injections, puncturings, setons, and even imperfectly applied ligatures, had been previously resorted to in vain. Besides, in children there is as much resistance and crying, and as much anxiety in parents, produced by a slight operation, as by a more effectual one.*

OF INFLAMMATION OF VEINS.

Veins are very susceptible of inflammation, and the action is very apt to extend along the coats rapidly; in some cases it reaches the right side of the heart, producing most violent symptoms, and speedy dissolution.

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* [In one instance I succeeded perfectly in effecting a cure with the seton. The tumour, about the size of a twenty-five cent piece, occupied the vertex, and possessed all the properties of the erectile tissue. The child was eighteen months old, and the swelling had made its appearance a few weeks after birth. Half a dozen coarse silk threads were passed, by means of a curved needle, under the base of the tumour, where it was allowed to remain for nearly a month. Considerable suppuration supervened, followed by the complete obliteration of the enlarged vessels. In the hands of Mr. Wardrop, of London, the caustic potash, applied to the surface of the tumour, as in making issues, appears to have been attended with great success. The practice of tying the principal arterial trunks connected with the swelling almost constantly fails, and is rarely resorted to except by ignorant and reckless surgeons. — Ed.]

Inflammation in the venous, as in the other tissues, may terminate in resolution. Otherwise, lymph is secreted, whereby the coats of the vessel become thickened, and its internal surface agglutinated, causing obliteration of the canal to a greater or less extent. Suppuration also occurs, and the pus may be deposited in a cyst formed amongst the coats of the vessels; or, as is most frequently the case, it is secreted from the internal coat, and occupies the canal of the vein. It then generally accumulates, its passage into the circulation being prevented by a deposition of lymph sufficient to occupy the calibre of the vessel betwixt the heart and the seat of the purulent matter. The termination in purulent secretion is accompanied with a high degree of constitutional irritation, and typhoid symptoms, more especially if any pus finds its way into the circulation.

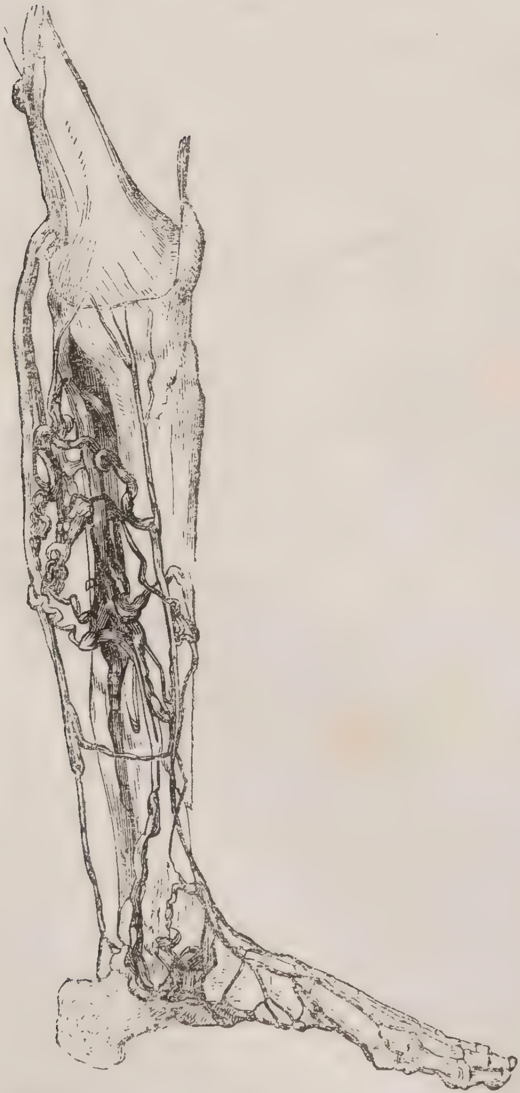
The integuments in the course of the inflamed vessel or vessels are of a dark red colour, and great pain is caused by pressure. Often there is a considerable œdematous swelling of the limb, occasionally followed by the formation of unhealthy pus, diffused in the cellular membrane, causing sloughing of that tissue, or of the soft parts more deeply seated.

This disease generally follows an accidental wound or operation, as venesection or amputation; it is also of frequent occurrence after the application of a ligature to the extremity of a vein. Many patients have died of this disease, induced by the application of a ligature to the vena saphena major, for the cure of varix. Wounding of large veins ought to be studiously avoided; and if wounded, the bleeding from them should, if possible, be arrested by pressure. When from any cause the extremity of a large vein in a wound is not closed, when it is not plugged up by plastic matter, pus seems to enter it readily, and by mixing with the circulating fluid causes dreadful mischief; great constitutional disturbance accompanies the purulent deposits which follow in the solid viscera and in the joints.

Inflammation of veins is a very unmanageable disease; the exhibition of purgatives and antimonials will be prudent, in order to evacuate the bowels, produce diaphoresis, and diminish the force of the circulation; the pain will also be much relieved by the application of warm fomentations to the affected part. General depletion is not admissible unless at the very commencement of the disease, and local bleeding must be had recourse to with very great caution; for by copious abstraction of blood, gangrene may be induced, or at least hastened. The limb must be altogether disused and elevated, the patient being kept in a state of complete rest, and not exposed to any excitement or anxiety. Blisters have been employed, but with no good effect. If the vein is much distended, and it is evident that it contains a confined accumulation of pus, it ought to be treated as a common abscess, the matter evacuated by an incision, and various dressings employed, according to circumstances. Such practice I have found successful, and not followed by any untoward symptoms. The abscess is often limited at each extremity by the deposition of lymph in the canal of the vessel; and after the evacuation of its contents, the cavity contracts, and the portion of the vessel which has been the seat of suppuration becomes completely impervious.

Inflammation of a vein is also occasionally followed by the sudden appearance of a purulent depôt in some part of the body, external or internal, at a distance from the inflamed part. Thus, in inflammation of a vein in the fore-arm, it is not unusual to find an abscess formed suddenly in the axilla on the opposite side; after amputation, or other capital operation, the patient is often suddenly affected with violent symptoms of disease in the chest, and, on examination, abscesses will probably be discovered in the substance of the lungs, the existence of which had only been suspected a short time previous to death. Possibly some pus globules, the seeds of disease, may be arrested in their course through the capillaries of these organs, and thus a foundation be laid for mischief. A very satisfactory explanation of these phenomena cannot readily be given.

It has already been noticed, that the softening of coagulated fibrin must not be confounded with suppuration. The fibrinous pulp has commonly been called pus, though erroneously; and when occurring in the veins, as it frequently does, has been generally described as inflammation and suppuration of the vessel. The distinction is important; first, because many of the so-called cases of phlebitis are shown to be of a different nature, and secondly, as to the theory of suppuration, on which subject many writers in this country have been engaged in making commentaries on, and compilations of, the French doctrines, which are not deserving of much regard.



There exists without doubt a capillary phlebitis, and the vast importance of inflammation, and its consequence in these vessels, will be estimated when their great extent and functions are recollected. It is probably in this class of cases especially that the blood becomes contaminated with pus.

Veins frequently become dilated or *varicose;* they assume a tortuous course, appear much enlarged, and present an elastic, soft feel, except in the situation of the valves, where they are more hard and incompressible: occasionally the tortuous windings form a bluish tumour of considerable size. The dilatation of the superficial branches is increased by heat, the skin being thus relaxed, so as to give less support. The limb is swollen and œdematous. The dilatation is generally supposed to be confined to the vessels near the surface, but it appears that the deep-seated ramifications are not exempt from the affection. When a dilated vein becomes inflamed, great pain is felt in the part; the vessel feels like a firm chord, its coats are much thickened, and its cavity proportionally contracted; lymph is effused, and by it the canal may be obliterated to a greater or less extent; a spontaneous cure is thus accomplished. In the lower limbs, the disease is often complicated with ulcers; and as long as the veins remain varicose, the ulcers are almost incurable, or if they are brought to cicatrise, the skin soon ulcerates again, and the disease is reëstablished. The coats of the vessel not unfrequently ulcerate, and blood is discharged in appalling profusion: such an occurrence may even prove rapidly fatal. Sometimes, though rarely, skin thinned by pressure from within gives way without previous ulceration, and profuse bleeding ensues.

The cause of this affection is obstruction to a free return of the blood; as by tumours, either natural or adventitious, from pregnancy, constipation, &c.; or by the tight application of a ligature round the limb, as of a garter. It often occurs in those who have been in the habit of great muscular exertion, the blood being thereby forced from the deep-seated veins into the superficial. This even occurs, though very rarely, in the upper extremity, and I have witnessed more than one instance of it. Here it is more readily got rid of. Dilatation of venous branches is met with in the scrotum, labium pudendi, lower part of the abdomen, in the neighbourhood of the anus, and at the lower part of the neck. The lower limb is, however, the most common seat of the disease: when the veins in this situation are dilated, the valves are insufficient to obstruct the calibre of the vessels, and consequently the lower and smaller ramifications have to sustain the column of blood in the superficial veins of the whole limb, its weight not being diminished by the support which, in the natural state of parts, is afforded by the valves; the disease is thus more and more aggravated. The left limb is generally the one affected; and this circumstance may probably be explained by the pressure of the sigmoid flexure of the colon on the left iliac vein.

In the majority of cases, the palliative treatment can only be adopted. The limb must be used as little as possible, and, if practicable, be kept in a state of complete rest; the veins must also be supported by the application of a bandage, or the wearing of a laced stocking. The Indian rubber bandage worn over the stocking or drawers answers fully as well as any other method. In some instances, the application of cold has been of advantage, by promoting the contraction of the dilated vessels. When pregnancy is the cause, it is needless to commence any method of cure, until the cause be removed; and the same remark is applicable when the affection arises from habitual constipation. The varices occasionally become inflamed, painful, and much swollen, with considerable œdema of the whole limb. Their contents become coagulated, and their coats thickened; in the end, the swelling abates and the vessels are closed. In certain cases, this spontaneous cure, a radical one, may be imitated by the surgeon; an escharotic being applied over the trunk of the vein at a healthy point, whereby inflammation is produced in the coats of the vessel, and obliteration of its cavity accomplished: the caustic which will be found most convenient and effectual, is the potassa fusa. The caustic may be made into a paste with soap; or a solid piece, of the size of a split pea, is placed over the vein, and there retained for a few hours by plaster or bandage. The vessel being obliterated, the lower venous branches necessarily pour their contents into those deeply seated; as they freely communicate with these, they readily empty themselves of their accumulated contents, and soon regain their calibre under the employment of bandaging. When the varicose veins are numerous, as is generally the case, the potass is to be applied to the healthy point of the larger trunk in which they terminate. But the practice is not unattended with danger, for the coats of the vessel may ulcerate in consequence of the application, and violent hemorrhage ensue; the degree of inflammation excited may be greater than that intended, and extend so as to give rise to suppuration in the vessel and the most alarming constitutional disturbance. These unfavourable results, however, must be of rare occurrence. Success has, however, followed the practice in innumerable instances.

A much preferable method, as being less painful and unattended with risk, is that of passing needles under the vessel, and twisting a piece of thick and strong silk round them. Two needles should be applied together, at an interval of about half an inch, at whatever points it is thought right to close the vein. Coagulation takes place in the included part, and also frequently for some distance below it; the coats of the vessel are thickened, and its canal closed. The needles are withdrawn before they begin to cut their way out by ulceration, — say at the end of from three to five days, — according as the parts become condensed. The needles suited to the purpose are soft, but tempered at the point, which is spear-shaped; the ends are cut off with pliers after the thread is fixed. Other operations have been performed on the veins, to procure a radical cure of varix; one or more ligatures have been passed round the vessel, as in the operation for aneurism; and the vessel has been divided, or a portion of it dissected out, and its cut extremities afterwards either compressed or secured. Such proceedings are now almost entirely abandoned.

OF TUMOURS.

A tumour is a swelling or new production, and not a part of the original composition of the body. Blood may have been effused, and the coagulated part, becoming organised, is increased in size by deposits from the vessels which enter it; or perhaps the blood, the coloured part of it at all events, is taken up and lymph is deposited, which, if not also removed, "undergoes further changes of a secondary nature, and remains a parasite or new structure." Its structure and growth are modified according to the action which its own vessels assume, independently of the surrounding vascular system. The bloodvessels may enter this new growth by a narrow pedicle; or it may be of such a form as to present an extensive surface, by which it communicates with the surrounding parts, receiving vascular ramifications from them. As the growth of the tumour proceeds, the surrounding part yield, are condensed, and form an envelope for the new formation; the neighbouring bloodvessels are excited to a greater degree of action, and more blood is poured into the vessels of the tumour; the action of these in turn is very vigorous, and the increase of the new growth is more and more rapid. They become, it would appear, dilated and tortuous. Morbid enlargement, or rather new productions, often attain an enormous size; some have weighed, when recent, upwards of 60 or 70 lbs. Tumours differ much in structure; and though their general appearance may not be dissimilar, one will scarcely be found exactly resembling another. In many cases, the external appearance proves no certain index of the nature of the tumour; sometimes, however, its feel and general external character lead the experienced surgeon to form a correct estimate of its internal structure. It is impossible, by any process of reasoning, to account for the different actions which these growths possess; and even minute anatomical investigation, either of healthy or morbid structures, has not as yet thrown much light upon the subject.

Tumours are divided into *Solid* and *Encysted.* The solid are generally enveloped by a dense cellular sheath of the surrounding cellular substance, yielding and becoming condensed in proportion as the tumour increases in size; this covering appears as a barrier between the healthy and diseased parts, shutting out the latter, as much as possible, from connection with the rest of the body, and preventing the former from participating in the injurious tendencies of the latter. Some tumours have no such limit, but extend in the direction where there is the least resistance, hold a free intercourse with the surrounding parts, and impart to them their morbid disposition and action; others are limited in their situation and communications, but prove dangerous or annoying from their bulk. Some grow rapidly, and prove troublesome in a few weeks or months; others remain without much increase for years, and produce little or no inconvenience. Occasionally tumours partly resemble the texture in which they grow; those of a fatty nature are frequently found to have their nidus in the adipose tissue; cartilaginous tumours project from the surfaces of bones or of a joint, are subsequently detached, and lie loose in its cavity; growths of a cellular structure internally, and invested by an apparently mucous lining, protrude from the surface of mucous membranes. Others differ, not only from the texture in which they are situated, and from which they derive their nutritive vessels, but also from every other part of the healthy structure. In one instance, a congenital tumour was found to be composed of an aggregation of numerous materials, many of them resembling the healthy textures of the body. But again, tumours are constantly met with, composed of matter which in no respect resembles any of the natural tissues of the body: those are what have been called heterologous formations.

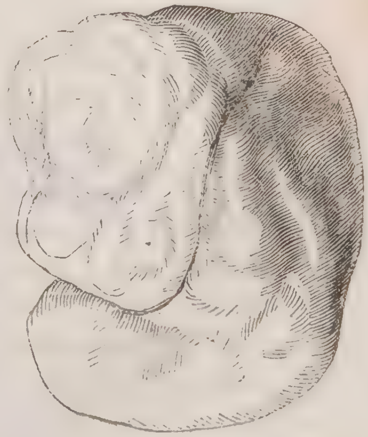
The simple tumour is mere enlargement of a part, from the infiltration of solid matter deposited by its bloodvessels. There can be little doubt that the action which lays the foundation of such enlargement is inflammatory: in consequence of inflammation of the tissue, lymph is effused into the cellular substance during the progress of the incited action; and after it has subsided, the dilated and debilitated vessels probably do not regain their condition, as to size and vigour, but remain somewhat dilated, and continue to free themselves from portions of their contents; thus the cellular tissue is opened out in proportion as the infiltration advances, and the process may be occasionally accelerated by fresh attacks of subacute inflammatory action. The patient at first feels pain, heat, &c., as in an inflammatory tumour; these afterwards abate, and ultimately go off entirely; and during the increase of the swelling, little or no pain is experienced, unless when these subacute inflammatory attacks supervene, and then it is but slight; or unless the enlargement be resisted by an unyielding structure, and then it is acute and troublesome. The size and rapidity of increase in such tumours will vary according to circumstances; the vessels of the part soon regain their size and action, either by the efforts of nature or of art, so that the tumour will have attained no great size, and be stationary in its progress, being denied the materials necessary for its increase. If the morbid action be thus stopped, the absorbents will remove the newly-formed matter, and restore the parts to their healthy condition. But when the deposition proceeds in a superior ratio to absorption, the new matter becomes organised, and by means of its own vessels, secretes a substance similar to itself, whereby the increase of the tumour becomes more rapid, and the new structure may attain an enormous bulk. Thus the tumour is formed, not merely by dilatation of capillary vessels, and extension of its original tissue, but by the formation of new matter, which, becoming organised, assumes a secreting power. At first the former circumstance is the chief cause of the enlargement; but after the latter process has existed for some time, the tumour loses much of its resemblance to the primary tissue, assumes a more dense structure and a different action, and therefore cannot be designated a simple enlargement.

This species of tumour, or rather this enlargement which precedes the formation of a tumour, is chiefly met with in the cellular and glandular structures. Sometimes it is described under the term of œdema solidum. In the scrotum, where the cellular tissue is remarkably loose and extensile, such tumours attain a very large size. They are found in this country, though more frequently in warm climates. I removed one from this situation successfully, which weighed upwards of 44½ lbs.; it had been of twelve years' duration, and caused much inconvenience to the patient. It is sketched in the *Practical Surgery*, p. 341. It occurs in the mamma, apparently in consequence of suppression of the menstrual discharge; the gland becomes enlarged, there is no pain in the tumour, and it feels soft and doughy. When the subcutaneous cellular tissue is the seat of the disease, the tumour is often of considerable extent, but rarely forms a great protuberance. It sometimes is situated in the coverings of the nose, which, as they become enlarged, lose their natural colour, and assume a purple hue; the mucous follicles also are often much enlarged, and occasionally emit a profuse discharge of their secretions. It can be readily understood that in this situation the tumour is a source of much annoyance, from its partially obstructing respiration, and even vision, interfering with the functions of the parts and the comfort of the patient.

It has been already observed, that when simple enlargement exists for some time the structure changes. It becomes more dense, and assumes a peculiar action, independent of that of the surrounding parts. It has a harder and more firm feel, and all traces of the texture in which it was formed are destroyed. It may be considered as the next in order to the one already mentioned, both as to the simplicity of its structure and action; but in consequence of its action being independent of those of the neighbouring parts, and liable to change from even slight causes, it is very apt to degenerate into those tumours which are more complex and injurious.

ADIPOSE TUMOURS.

Another species of tumour seems to be composed almost entirely of fatty matter insinuated amongst extended and delicate cellular substance, and has been therefore termed adipose. It is surrounded by a cyst of dense cellular tissue, and to this it loosely adheres; its bloodvessels are few, and it is of an inactive and innocuous character. It is generally lobulated, and often attains a large size. It is not only irregularly prominent on its outer surface, but in its whole circumference, and its lobuli often insinuate themselves to a great depth amongst nerves, bloodvessels, and other important parts; owing to this circumstance they frequently prove a source of the greatest inconvenience from their bulk, for of themselves they are neither hurtful, nor possess any disposition to involve those parts with which they are in contact. This tumour is found only in the cellular and adipose tissues. From its loose connection with its envelope, it admits of ready removal by operation. A tumour of this kind is here represented, which, but for this circumstance, owing to its awkward situation under the tongue, could not by any possibility have been extirpated. It is fully larger than an orange, and had caused very great suffering. It is not so much lobulated as fatty tumours generally are. The adhesions of adipose tumours are, however, rendered firm and more numerous by pressure or external stimulants — in fact, by whatever induces inflammatory action in its substance or in its surrounding connections; and from this cause the extraction is often rendered exceedingly difficult. The skin becomes thickened and of a red hue, and the tumour itself is much more vascular. From this cause it is apt to assume a

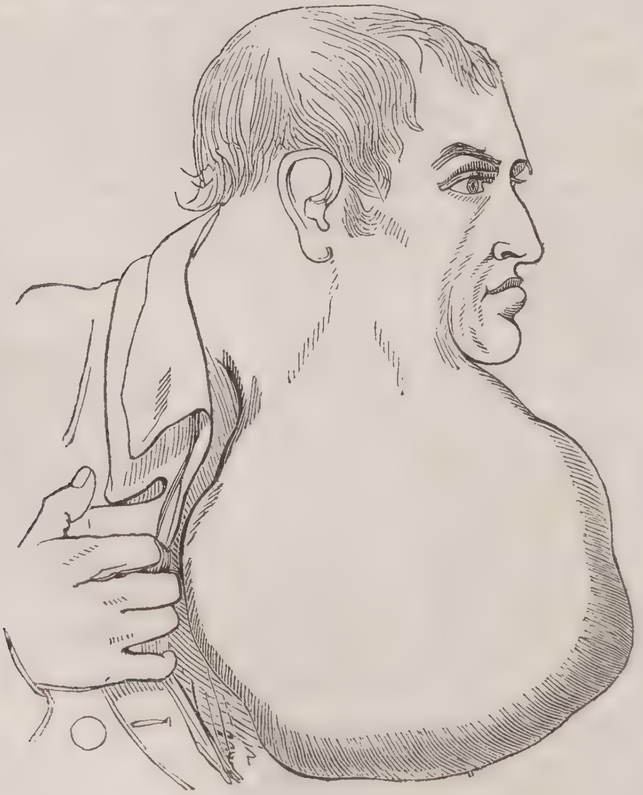


new mode of action, and to change in structure and in character, invariably for the worse. I have removed a few tumours, originally of this benign species, but which had apparently degenerated and assumed a malignant action. In one, distinct indurated bands radiating from a central mass of the same kind, are discernible. In two others, as a consequence of pressure, condensation and ultimate softening had occurred. The largest alluded to was removed from betwixt the shoulders of a soldier, and had borne the pressure of his knapsack for eight or ten years. It was attached by a thickish neck, presented the common lobulated appearance of adipose sarcoma; but its external surface, its feel, and section, were very different.

The patient does not complain of any pain or uneasiness in the tumour, unless inflammation be excited in it; then the pain and other symptoms are such as attend incited action, and the sensations which are afterwards experienced vary according to the character which the tumour assumes. Certain changes may occur in its texture, though not in its general character or disposition; thus osseous or earthy matter is occasionally deposited in some part of the tumour, while the surrounding adipose substance retains its appearance and density. Suppuration, it is said, has followed inflammatory action, excited in an adipose sarcoma.

OF FIBROUS TUMOURS.

Fibrous tumours are not uncommon, and are formed in various textures. In general they are composed of a substance of a dirty

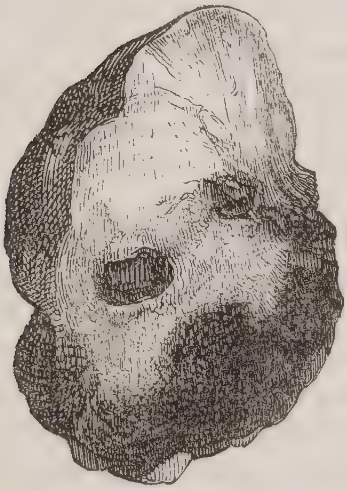


grey colour and considerable density, through which minute, firm, ligamentous fibres ramify; in some cases irregularly, in others radiating from the centre of the tumour. The new formation is surrounded by condensed cellular tissue, to which it intimately adheres, and does not mingle irregularly with the surrounding parts; in this respect differing from malignant tumours, which occasionally contain fibrous matter. It cannot be considered of an equally innocuous nature with those already described, but is still, in its original state, not of a malignant disposition. After some time, the consistence and structure of such tumours vary: some are of a loose texture, and contain cells; others are hard, and intermixed with cartilaginous matter, or even with bone. In general, the tumour is slow in its progress, though it may attain a very large size, as seen in the cut on the preceding page, if allowed to remain; occasionally its growth is rapid.

Besides those tumours which have been described, there is a number of others not of a malignant disposition, which are so various in their structure as to baffle all attempts to reduce them to a scientific classification. Some are composed of a homogeneous substance of almost cartilaginous consistence and a whitish colour; some consist of cartilaginous matter, mixed with substance of less density and of a different appearance; in some, fibrous matter is mixed with a homogeneous glandular-looking substance, partially softened. Some are almost entirely composed of osseous matter; others contain it in small proportion. It would be endless to enter into a minute detail of the structure of such tumours, for it may be said that their appearances vary with their number. In almost all tumours cysts are found, and the internal structure of some tumours consists almost entirely of cysts, or hydatids, as they have been called; in others, these only occupy certain parts, and compose but a minor feature in the structure. The sacs are generally lined with a delicate and smooth membrane, which is often vascular at various points; some contain a transparent and glairy fluid, albuminous or gelatinous; some bloody serum; some purulent, some curdy matter, or this mixed with a serous or purulent fluid; some pure blood; some a fluid like printer's ink; and not a few are occupied by a dense elastic substance, which, on a section being made of the tumour, rises irregular and ragged above the cut surface. Some tumours are smooth; others lobulated or tuberculated.

OF ENCEPHALOID TUMOURS.

The tumour which comes next to be described is decidedly malignant. It is the Encephaloid, or Medullary Sarcoma. Although these tumours have been called encephaloid and medullary, it must not be understood that their intimate structure has any relation to that of the brain or marrow; for this reason the old term *fungoid* is perhaps a preferable one, since it leads to no false notion as to their nature, while it expresses a condition which at one time or other is remarkably characteristic of them. This tumour consists of a homogeneous matter, resembling the substance of the brain in colour and consistence. It rarely has a distinct cyst; occasionally it is subdivided by membranous bands. It is always soft, though often more so in some parts than in others; portions of it being frequently so much softened and broken down as to resemble thick cream in consistence, and these are generally of a darker colour, from being mixed with a greater or less quantity of effused blood. Partial or universal softening only occurs after the tumour has existed for some time, for in its original state its structure and density are uniform throughout; and, on making a section of it, some few drops of blood may escape from vessels, the coats of which are of a very delicate nature. Some of these vessels seem to give way, in consequence of the process of softening, for we frequently meet with fluid blood, or masses of fibrin, in the midst of the pulpy matter; and, when the softening has been extensive, the blood is diffused throughout the whole substance of the tumour, so that it will appear to be chiefly, or entirely, composed of effused and degenerated blood, as here represented.



The mamma and testicle, and the contents of the orbit in children, are the most frequent seats of this disease; it not unfrequently occurs in the lymphatic glands, and few textures can be considered as exempt from it. The part at first enlarges slowly: but afterwards the disease advances with great rapidity, involving the adjacent parts. In general, the affection is not attended with much pain; the part has a spongy and elastic feel, and frequently presents an obscure sense of fluctuation, indicating that softening is more or less begun. The skin is tense, generally brownish, and is pervaded by large venous branches. This venous enlargement is always observable in the advanced stage of the disease, before or after ulceration has taken place; it is peculiarly evident in the eyelids, when the contents of the orbit are involved, and is to be attributed to obstruction of the circulation in the deeper vessels. The tumour is increased by the surrounding parts assuming a similar action, and being converted into a similar mass; and the disease also seems to be propagated by means of the absorbent system, and by the irritation conveyed along the vessels which emanate from the tumour, or from its immediate vicinity. Thus, when the testicle or mamma is affected, the lymphatic glands, both above and below the tumour, and the course of the absorbent vessels, are converted into an encephaloid mass, all traces of their glandular structure being completely destroyed. The same brain-like or cancerous matter is also found in the bloodvessels, large and small. When the disease has been of long duration, the superincumbent integuments appear tense, assume a purple colour, and ultimately ulcerate; a portion of the pulpy mass then protrudes, of a fungous appearance, the resistance being at that point removed, and the compressed matter relieving itself by the extension of a portion of its substance; the protruded portion afterwards becomes discoloured, and sloughs, to be speedily reproduced either by further dilatation, or by actual increase of the tumour; unhealthy pus is discharged, often mixed with blood, and occasionally slight hemorrhage occurs; the integuments become further ulcerated, assume a dull brown colour widely around, and are undermined, presenting a boggy feel.

Along with these local symptoms, there is a complete subversion of the system, — there being at first symptoms of constitutional irritation, afterwards those of hectic and extreme exhaustion. When the lympathic glands are diseased, the limb beneath is much swollen from œdematous effusion, the return of the blood and lymph being prevented; violent and excruciating pains are experienced in the course of the nerves of a limb; it also frequently loses its sensation, from those organs being either involved in the disease, or pressed on by the tumour. The vessels in the neighbourhood of the affected parts are materially altered, though they are seldom converted into encephaloid matter; the arteries are often completely obstructed by coagulating lymph for a considerable extent, and the coagulum not only occupies the principal trunk, but extends into the minute ramifications; and this explains why hemorrhage seldom occurs, even after ulceration of the tumour is far advanced; the veins also are frequently obstructed in a similar way; but in many cases they contain a soft and pulpy matter, exactly resembling the substance of the tumour. The fungus which protrudes after ulceration of the integuments sometimes bleeds, when it would appear that the hemorrhage proceeds from those bloody collections in the substance of the tumour already mentioned. According to my experience, when bloody points, or cysts containing bloody fluid, exist in a medullary or other tumour which has been removed, and if the diseased matter be reproduced, a bleeding fungus will almost certainly follow. This species of tumour occurs in all ages and in all situations, and during its progress evinces strong proofs of inveterate malignancy: if removed early, the disease may be arrested; but if the operation be long delayed, a tumour of a similar nature, and more extensive, will almost invariably be produced. In several instances I have removed encephaloid tumours, from the situation both of the mamma and testicle, and the disease did not return; but in the other cases the result has been as above stated. Encephaloid disease of the internal organs frequently supervenes on that of the external parts, and accelerates the patient's dissolution; when in such situations they are beyond the reach of surgical art, and their existence is only, if at all, ascertained, in order to enhance the unfavourable nature of the surgeon's prognosis.

OF MELANOID TUMOURS.

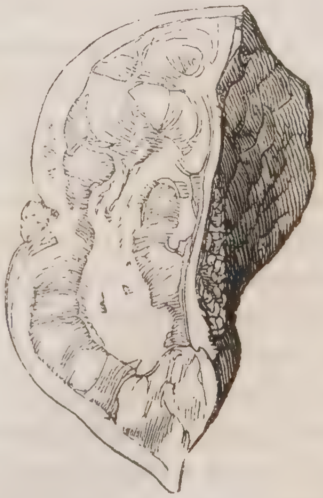
The Melanoid tumour is rather of rare occurrence in the human subject; it originates in the cellular tissue, and most frequently attacks the internal viscera; sometimes it occurs in the eyeball, where it has been seen with the encephaloid disease, and occasionally melanotic matter is diffused amongst the cellular tissue throughout the whole body, even in that of the bones. The external surface of the tumour is generally of a shining and mottled appearance; internally it consists of a homogeneous black matter infiltrated into the cellular tissue, which is condensed, and in some cases distinctly increased in vascularity. The tumour, seldom of a large size, extends chiefly in a lateral direction. Occasionally it is pretty firm; in other instances it is soft, broken down, and semifluid. The melanotic matter is not always so deposited as to form a distinct tumour, but frequently seems to be sparsely infiltrated into the cellular tissue; and occasionally it is diffused in so minute a quantity as merely to tinge the part, or form dark streaks. Sometimes it is infiltrated in the substance of an organ, and sometimes it is effused on its surface; occasionally it is surrounded by a distinct delicate sheath; usually it is confined by no envelope, excepting the partial condensation of surrounding parts. In the skin it sometimes presents in a tubercular form. The tumour is said to be chiefly composed of albumen, mixed with a peculiar colouring matter. The disease mostly occurs in the trunk, seldom in the extremities; it is not uncommon in the orbit, and in the internal organs the melanotic deposits are generally both numerous and extensive. There is seldom pain, and the patient seems to suffer chiefly from lassitude and extreme debility, which gradually increase; anasarca frequently supervenes; the functions of the organs affected are much impeded, or even altogether destroyed, and thereby the sinking of the powers of life is accelerated according to the viscera affected and the extent of the disease. Melanosis occurs most frequently in advanced life, though it is not confined to it; whereas encephaloid attacks indiscriminately all ages.

OF CARCINOMATOUS TUMOURS.

The most malignant and intractable of tumours is the Carcinomatous. This term is applied to the disease in its occult state, whilst Cancer, a term pretty indiscriminately employed, may denote its condition after ulceration. The word scirrhus is often used synonymously with carcinoma; but the former has been, and still is, improperly employed to denote indurations and enlargements of structures in all situations, and has been altogether so much abused as to warrant its being erased from the nomenclature of diseases. Carcinoma seldom occurs before the age of thirty, and generally not till a later period of life; there are instances, however, of its appearance at a much earlier period. Very frequently it is not primary, but supervenes on adventitious formations originally of an innocuous character, and which might have long remained so. All tumours, though at first not of a hurtful tendency, are liable to assume malignant action, either from a constitutional cause, from external injury, or from latent disposition. When it occurs in newly-formed parts, the surrounding cellular substance is frequently condensed and thickened, so as to form a cyst round the tumour; and when it supervenes on chronic tumours, the cysts which enveloped these remain, for some time, as entire and distinct as formerly, though the character of their contents is remarkably changed. Afterwards the cyst may be contaminated with the same disposition as its contents, assume the same action, and be converted into a similar substance. When the disease is seated in the lymphatic glands, the cyst is at first distinct, and gradually disappears; whilst in this affection of the conglomerate glands a cyst is at no time perceptible, and the cancerous matter insinuates itself, and is lost, in the surrounding substance. The carcinomatous tumour is of great density, and communicates a peculiarly grating sensation and noise when cut. In its section there appears a central point, or nucleus, from which dense ligamentous bands of a white colour proceed towards the circumference, diverging in regular succession, as rays of light from a luminous body; or the larger bands subdivide into smaller ones, which follow a similar course with their parent trunk, or ramify regularly; or, from the first, follow an irregular and intricate course, uniting with and crossing one another, so as to present a retiform appearance. In general, the interposed substance is of a greyish colour, extremely dense, and generally homogeneous, though sometimes granular. Often the ligamentous bands are so numerous, and so intimately interwoven, as to leave little or no room for any intervening substance. Sometimes, and most frequently in the advanced state of the tumour, the greyish matter appears to have been broken down and removed, its situation being occupied by a glairy or turbid fluid, by a soft pulpy substance, or by blood; the parietes of such cysts are formed by the whitish bands, which sometimes appear to be much thickened, and coated with a membranous lining. The term gelatiniform cancer has been applied to that kind in which the reticulated texture is filled with glairy-looking fluid. Frequently, as has been already observed, the external cyst or covering becomes assimilated to the substance of the tumour, and the ligamentous bands then shoot forward into the surrounding tissues, more especially the cellular and adipose, establish a new footing for the disease, and thereby gradually enlarge the boundaries of the original tumour. All parts in its immediate neighbourhood become affected, and none withstand its morbid and destructive influence; bone, muscle, ligament, skin, and membrane, are successively or simultaneously involved; and even the bloodvessels and nerves. From what has been already said, it is almost superfluous to add that the tumour is most malignant, incessantly encroaching on the neighbouring parts, and imparting to them its own disposition; and this too frequently continues to exist after the removal of the primary source of the evil. The disease, in its commencement, occupies a minute and limited space, composed, it has been said, of enlarged and varicose capillaries, interspersed with the peculiar matter of cancer. It would even seem that these dilated aneurismal or varicose vessels, in morbid growths, are from the first gorged with what has been called heterologous matter. Judging from the imperfect account which has yet been given of them, it would appear, from the observations of Mr. Kiernan, that cancerous growths are entirely vascular in their early stages,—composed, in fact, of capillaries filled with cancerous matter, which shoot from the free surfaces of membranes in a flocculent or villous form, having no albuminous matrix, as has been commonly imagined in regard to adventitious growths generally; the progress of the cancerous tumour appearing to depend on the multiplication of the capillaries, their becoming remarkably varicose, tortuous, and dilated, the dilatation being accompanied by thinning, by more or less absorption of their coats, so as to allow of the escape partially of the accumulated matter from their cavities. Thus may be formed a tumour of unlimited extent. As the secerning vessels are excited to undue action in all cases where they have to form and supply preternatural growths, it is to be expected that they will in such cases become enlarged. Accordingly, the enlargement both of the smaller arteries and veins in tumours, generally, is a fact with which surgeons who have been in the habit of operating on such parts must be familiar. Farther, the enlargement of the capillaries in inflammation has been shown by the experiments of Hastings, and Thompson; and Mr. Gulliver, who informs me that he has seen pus in the capillaries of a suppurating surface, remarks, in regard to the observation of Professor Müller, as to the capillaries having only the diameter of a blood corpuscle, that these vessels become during suppuration sufficiently dilated to admit of rows of pus globules. Thus, during the formation of an ordinary product of inflammation, the capillary vessels are enlarged; and if excited to still further activity, and for a more protracted period, in the nutrition and formation of tumours, the minute vessels will become still more dilated, and filled with other materials than purulent matter. In a melanotic eye, which I lately examined with Mr. Dalrymple, there was a part in which the black matter seemed to be contained within the capillary vessels.

The cancerous tumour afterwards presents a stony hardness, is generally of a globular form, and irregular and unequal in its surface. At a still later period it gradually enlarges, in the way already mentioned, remains moveable for some time, but ultimately becomes fixed by the increased extent of its connections. By these circumstances it may, in general, be distinguished from the tumours which, from the first, occupy a wide space, and are firmly fixed by intimate connections with the surrounding parts. When the tumour has once been developed, its progress is slow and steady, being arrested, or made to recede, neither by the efforts of nature nor by the interference of art. Pain is generally complained of in the region of the tumour, and is of a lancinating kind, compared by the patient to the passing of sharp instruments through the part; occasionally, however, there is no pain in the new formation, and little inconvenience is caused by it. When the disease is left to itself ulceration occurs, frequently at an early period; but sometimes only after the tumour has been of long duration. The superimposed integuments appear stretched, change their natural colour, assume a dusky or livid hue, become attenuated, and ultimately give way; the breach of surface not being caused by tension and pressure, but by the parts having assumed an action similar to that of the tumour. The ulcerated point slowly enlarges, a thin ichorous fluid is discharged, the surrounding integuments are of a dusky red, and the margins of the ulcer are thickened, callous, everted. Whilst the destructive action proceeds in a lateral direction, it at the same time advances towards the more deeply-seated parts, the cavity becomes excavated, irregular, and ragged; and the parts seem to be destroyed partly by ulceration and partly by sloughing. The exposed surface seldom aims at reparation; and when it does, the granulations are greyish, hard, warty, and endowed with but little vitality; never investing the whole surface, but protruding from certain points, and presenting somewhat of a fungous character. The thin unhealthy discharge becomes profuse, and exhales a peculiarly fetid odour, highly offensive to the patient and attendants. By these means the ulcerated cavity may attain an enormous size, presenting a most disgusting and lamentable spectacle. If the patient bear up under the profuse discharge, the greater part of the original tumour may be destroyed by the ulceration, and some attempts may be made at cicatrisation; that is to say, the cavity may contract, and granulations be formed: but these are always unhealthy, and, in fact, carcinomatous, and often bleed profusely. New skin is seldom formed, the remaining parts resume their virulency, and the process of destruction again advances, surpassing the former both in extent and rapidity.

Along with these local symptoms and appearances, it can be readily understood that the constitution is, from the first, materially affected. The alimentary organs are deranged in function, the patient has a wan and sallow countenance, and is in general weak and much emaciated. After ulceration, the system is still more reduced by the discharge, the patient becomes hectic, and is often afflicted with diarhœa; along with the other symptoms of extreme debility, the patient may become anasarcous, is affected with cough and dyspnœa, or by other symptoms indicating disease of some internal organ, and is ultimately carried off in a state of exhaustion.



The disease attacks various textures, but perhaps most frequently the mammary gland. The mamma generally diminishes in size from absorption of the fatty matter; the nipple is retracted, often to a great degree, and the surrounding integuments are of a purplish hue, and exude a sanious fluid; at length the nipple is completely destroyed by ulceration. In other instances the tumour is large, and there is a hard œdema of the integuments; the skin is thick, coarse, and of a dark red colour. The tumour soon adheres immoveably to the subjacent muscles and ribs, converting the contiguous portion of the former into a substance similar to itself. There may be other varieties in the appearances and symptoms of carcinoma; but the above are those which are most frequently observed, and are sufficient to denote the general character of this species of tumour, and to show its peculiar and inveterate malignancy.

Ulcers or swellings, at first simple, may assume a malignant action, either carcinomatous or of another kind; thus, in one instance, a simple ulcer, produced by a burn, assumed a foul and unhealthy aspect, and ultimately degenerated into a most malignant sore. Various malignant actions commence in glands of the conglobate or conglomerate kind, at first simply enlarged from irritation or injury. The female breast often becomes indurated from a blow, or from milk abscess, and remains for a series of years, half a lifetime perhaps, without any perceptible change in the enlargement and induration; but the tumour frequently is roused into activity at the critical time of life, and malignant action ultimately commences. The menstrual period ought to be particularly attended to in affections of the mamma more especially, but also in all tumours and ulcers; for both during and before it tumours become larger and more painful, the whole system appears to be excited, then relaxed, and all morbid actions seem to possess increased activity.

In this disease, as in soft cancer, as it has been called, (and they occasionally pass into each other,) the bloody masses, or sacs containing bloody fluid, are to be dreaded, and when they exist are to be considered as very unfavourable; for if, on the removal of a carcinomatous tumour, such appearances be found, the disease will certainly return; a new tumour, of even a worse character than the preceding, will be formed; a fungus will be protruded, and from this hemorrhage will occur.

The lymphatic glands, both above and below the tumour, generally enlarge early in the disease, become hard, and cut like cartilage, and with a grating noise. Frequently they become converted into a dense and fibrous substance, resembling carcinoma; sometimes they are softened and broken down at several points, and contain a purulent or bloody fluid. They enlarge, coalesce, and form irregular masses, which rise more and more above the surface; the superimposed integuments give way, and then occur those destructive ravages by ulceration and sloughing already described. The lymphatic vessels entering these tumours and emerging from them feel hard and wiry, as if thickened. The integuments in the neighbourhood of the tumours, and in the course of these absorbents, are of a blue colour, and the veins enlarged and tortuous; the limb below the enlargement swells and is œdematous. The absorbents often become affected months or even years after the removal of the original and exciting tumour; the immediate cause being taken away, yet the inherent disposition to malignant action is too often left, not to be eradicated. In fact, the disease generally returns, either in the original integuments, in the form of tubercles or buds, in the cicatrix, or in the glands; very frequently all are affected. It seems also to spring not unfrequently from fascia. Such enlargements of the glands have been said to arise, in the first instance, from irritation, and not from any participation in malignant action; and on this supposition, though in general extremely incorrect, cruel, bloody, and unnecessary operations have been performed.

Cancer seizes either the mucous or the cutaneous surface, with hardness and a warty excrescence; this ulcerates, and is surrounded by a hardened base. The process of destruction advances, and the ulcerated part presents the same appearances as those of a sore arising from a similar action in a deeply-seated carcinomatous tumour. The glands also enlarge, and assume the same aspect as if they had been the original seat of the disease. Some pathologists seem disposed to deny this, but apparently on no very sufficient grounds.

FUNGUS HÆMATODES

Has been much confounded with medullary sarcoma, but the two diseases are materially different. Fungus hæmatodes almost always supervenes on other morbid formations, when they have been ulcerated and exposed; and the particular formation which most frequently precedes is the medullo-sarcomatous; a bleeding fungus, however, occasionally protrudes from tumours of a different character, which, though they may have been at first simple, have degenerated, ulcerated, and assumed a malignant action. The disease certainly does not occur so frequently as some have asserted; for many, instead of limiting the application of the term to those fungous protrusions which bleed, honour with the appellation of fungus hæmatodes every growth which protrudes after the ulceration of a tumour, and every tumour which is unusually prominent, of soft consistence, and of a somewhat fungous appearance, although such have never shown any disposition to bleed, either spontaneously, or from irritation. But fungus hæmatodes, as the name implies, is truly a fungus which resembles blood; and as bloody or blood-like tumours are formed from the rupture of some vessel of rather a large size, and as they almost invariably evince a tendency to profuse hemorrhage, as a necessary consequence of the mode of their formation, the term is correctly applied only to those fungous growths which either have at one time emitted a discharge of blood, and exhibit symptoms of a recurrence of the hemorrhage, or which frequently pour out a quantity of blood, sometimes inconsiderable, but often profuse, and generally altogether uncontrollable. In short, the circumstances necessary to entitle a morbid formation to the appellation of fungus hæmatodes are a fungous structure and appearance, and hemorrhage proceeding from it to a greater or less degree, and with more or less frequency. Fungi are frequently met with, but there are certainly few hæmatoid fungi.

The excrescence is generally of a dark colour, resembling a mass of coagulated blood, but of more soft consistence, and its extremity has often a sloughy appearance. It is evidently organised; for, on being injured even in a very slight degree, hemorrhage ensues from the part which has been broken or contused, and frequently the growth bleeds spontaneously. At first the hemorrhage is in general slight, but is often repeated, becomes very profuse, and in most instances cannot be arrested. The vessels in the substance of the morbid mass are diseased in their coats, and have altogether lost their power of contraction; they give way either spontaneously or by laceration, and by their non-contraction they appear to serve merely as passive tubes, through which the blood is poured out by the active vessels which supply them; the latter are not exposed to any of the causes which tend to produce speedy obstruction of their canals, therefore continue to transmit their contained fluid through their subservient branches, and from this the uncontrollable nature of the hemorrhage can be accounted for; from the number of vessels which supply the new structure, and which are thus employed, it can be readily imagined that the hemorrhage will be profuse. In many instances, the application of firm pressure on the limb above the seat of the disease is even insufficient to arrest the flow of blood; and though this may, in some degree, be explained by supposing the continued stream to be venous, still it must be confessed that the disease appears connected with a peculiar hemorrhagic tendency. Frequently the fungus is found to communicate with, or rather to arise from, numerous cysts of a glossy appearance, from which also blood is copiously effused. The surrounding tissues are completely disorganised in the immediate neighbourhood, and also much altered in structure for a considerable extent around; the muscles, besides their disorganisation, have acquired a peculiar brown hue. Sometimes the hemorrhage does not seem to proceed so much from the fungus as from the subjacent cysts; for when a superficial incision or puncture is made into it, the bleeding is often inconsiderable, and only becomes alarming after masses of coagulated blood have been removed, and the cysts thereby exposed. Occasionally the fungus communicates with a cavity of enormous size, filled with blood, partly coagulated and partly fluid, and from the parietes of which the hemorrhage proceeds. When the disease has supervened on a medullo-sarcomatous tumour, the coagulated blood is mixed with a substance resembling the brain in a state of putrescence. It may supervene on polypous tumours, particularly of the antrum; and of this I have seen several instances. Sometimes it is produced after the removal of a tumour apparently not of malignant character, and in this case it frequently does not appear till the wound has almost cicatrised. When once established, it proceeds with all its virulency. The diseased parts may be removed as frequently as they appear; but they will be reproduced, and the disease will assume a still more frightful aspect, both in extent and malignity.

In consequence of the repeated and profuse loss of blood, the patient is gradually worn out, becomes hectic, is affected with nausea, vomiting, and indistinct articulation, with all the symptoms of extreme debility, and he generally sinks exhausted, or may be suddenly carried off by profuse hemorrhage.

The size of the bleeding fungus is extremely various, but it is rarely large; in fact, we frequently find that the most violent hemorrhage occurs from those of a small size; and in illustration of this, I shall briefly relate the following case. A man, aged forty, had been afflicted for some time with ulceration in the ham, and exfoliation of the posterior part of the femur. The sore healed; but about two years afterwards the cicatrix became ulcerated, and produced a very small fungus, resembling, in fact, a minute cluster of exuberant granulations: from this blood was effused in small quantity, and was easily restrained by the application of a bandage; but the hemorrhage returned at various intervals for upwards of a week, became extremely profuse and altogether uncontrollable. By this the patient was greatly exhausted, and amputation was rendered absolutely necessary. On examining the limb, the lower portion of the femur was found somewhat enlarged, its internal structure completely destroyed, and the periosteum on the inner side much thickened. On the posterior and inner part of the bone, about three inches above its articulation, there was a small fungous tumour of an irregular surface, and of soft consistence, resembling congealed tallow. From this excrescence the blood had been effused into a cyst formed amongst the muscles, and afterwards discharged externally. He recovered from the amputation, and remained well.

THE PAINFUL TUBERCLE,

Though of small size, and not possessed of malignant action or disposition, is a tumour of very great interest, on account of the excruciating pain with which it is accompanied. It is mostly situated in the subcutaneous cellular tissue, but not unfrequently in the intermuscular cellular substance; one tumour of this species which I have removed was so deep as to be in immediate contact with the sheath of the posterior tibial nerve. The tumour, generally of the size of a garden pea, rarely exceeds that of a cherry. It is invested by a dense ligamentous cyst, to which it intimately adheres; but occasionally the capsule is thin and cellular: in many instances its surface is perfectly smooth, in others it is slightly nodulated. It is not connected with any large nervous trunk; but minute nervous fibrillæ can occasionally be traced expanding on its surface, and apparently entering its substance. Internally it is composed of numerous whitish fibres, of considerable density, ramifying irregularly throughout its structure; and betwixt these is insinuated a firm substance, generally of a grey colour, and frequently of an almost cartilaginous consistence. Such is the structure most frequently observed; but in this morbid formation, as in all others, the appearances may be said to vary in almost every instance. Sometimes the fibres are indistinct, and of a yellowish or dirty grey colour; and the interfibrous matter is often found to vary in density and colour in different tumours, being at one time dense and almost transparent, at another opaque and cartilaginous, and sometimes rather soft, brownish, and occasionally tinged with blood.

From attentive examination, it appears extremely probable that the enlargement is at first produced by infiltration of lymph betwixt the fibrillæ of a nervous twig, which becomes separated and inclosed by the deposit — that they afterwards increase in size — that the interfibrous matter is deposited in greater quantity, and is farther condensed — and that thereby the nervous filaments are still more separated and extenuated. In short, it would appear that the fibrous matter is nervous, though altered, and that the interposed substance is organised and condensed lymph. The tumour, at first extremely minute, enlarges slowly; when deep, it can only be obscurely felt, and its existence is with difficulty discovered by manipulation; but the attending symptoms are so peculiar, and so forcibly developed, as to lead the surgeon at once to an accurate diagnosis. When it is subcutaneous, the skin is rendered slightly prominent, and the size, density, and loose connections of the growth, are readily ascertained. The slightest pressure causes the most excruciating torments, and totally unmans the patient, even though induced by the most trifling movement of the adjoining muscles. From a fearful and well-grounded knowledge of this circumstance, the patient is extremely anxious to preserve the limb in a state of complete rest, and, in fact, he is often wholly unable to use it; although the part is completely set at rest, still he frequently suffers from paroxysms of severe pain, commencing in the tumour and shooting through the limb. The painful sensations are sometimes very much alleviated by gentle friction with the hand. The disease is most frequent in the extremities, and in the inferior more than in the superior.

The larger nervous trunks sometimes become diseased, being affected with an enlargement resembling the structure and appearance of the preceding tumour, and such enlagements are termed *Neuromata.* Occasionally a portion of a nervous trunk is thus enlarged, from a blow or wound; and sometimes there can be no cause assigned. Nerves when divided, become bulbous on that extremity towards their centre. In stumps this is well seen; whilst all the tissues entering into it, after a time shrink, and become more or less atrophied (bone, muscles, vessels, &c.), the extremities of the nerves swell out and present a bulbous appearance. When these tumours are connected to, and only covered by, integument, or when they are adherent to the ligamentous substance covering the bone, and become exposed to pressure, as in badly made stumps, the patient often suffers excruciating agony. The nervous trunk above is, in general, slightly enlarged, sometimes has a tortuous course; and in some instances the neurilemmal bloodvessels are considerably increased in size. The same symptoms exist, though in a less acute form, as in the painful tubercle.

OF POLYPUS.

A common species of tumour is that which is attached to a mucous surface, and is called Polypus. Polypi vary in structure and disposition; some are simple and benign, others are most malignant. The simple mucous polypus has a shining appearance, being invested by an extremely delicate membrane, in some degree resembling the mucous, and moistened by a fluid similar to the mucous secretion; it is of soft consistence and homogeneous structure. They are generally light brown, sometimes greyish, and in some degree diaphanous. They are connected to the mucous membrane by a narrow pedicle; generally occur in clusters, and are of pyriform shape; one or more are often suspended from one narrow base, and they seldom attain a large size. They possess but little vascularity, though occasionally minute vessels are seen ramifying pretty freely on their surface, and may be considered as almost devoid of sensibility. The malignant polypus, on the contrary, is always attached to the mucous membrane, and also to the subjacent parts, by means of a broad base; and its form and structure vary according to the particular action which it has assumed. Most frequently it is encephaloid, of an irregular form, and often presenting a cauliflower appearance, its surface being studded with numerous excrescences of medullary consistence and colour. Such tumours will be afterwards treated of, as occurring in different situations.

OF ENCYSTED TUMOURS.

Along with these have been classed the enlargements of bursæ, sheaths of tendons, &c., but with equal propriety might we include hydrocele and other collections in natural cavities. Encysted tumours are almost always situated superficially. The skin is distended, seldom inflamed, and often contains enlarged bloodvessels, which give it a streaked appearance. They consist of an external cyst, which is in some instances extremely thin and delicate, in others dense, of considerable thickness, and composed of fibrous looking substance, occasionally it is almost cartilaginous; the internal structure may be said to be almost always more or less fluid, but varies much in consistence. The tumour is surrounded with condensed cellular substance, which is of greater or less thickness and strength according to the size of the tumour. Some of these tumours are supposed, and on good grounds, to be mere enlargements of the natural mucous follicles, in consequence of obstruction in their ducts, by hardened and vitiated secretion; the cyst, therefore, will be at first thin and delicate; its contents will resemble the natural secretion of the follicle, and in many cases may be readily squeezed out. There is a black point on the most prominent part, marking the obstructed orifice of the follicle, and the sac is found at this point to adhere firmly to the skin. Even after all other marks of its original formation have disappeared, the situation of the orifice is sometimes indicated by small dark spots, by depression, or by a minute ulcer.

Encysted tumours, or wens, as they have been called, often appear to be hereditary; seldom occur single, and are met with under the surface of all parts of the body. They have been divided into different classes, according to the nature of their contents: *Atheroma-*

tous, containing curdy matter; *Meliceritous,* containing a substance like honey; and *Steatomatous,* containing fatty matter, generally in a semifluid condition. But such terms are not adequate to express the nature of all encysted tumours; they are extremely various in their actions, and their contents vary according to the particular secretory action which the lining membrane of the cyst assumes; for the same reason, also, the contents of a tumour will differ in the different stages of its progress. Some contain a thin, fetid, brown fluid, mixed with solid particles, resembling half-dissolved fibrinous matter; in some the contents are serous, or seropurulent, — in others they are gelatinous; whilst in those which have become inflamed from external irritation, the contents are altogether purulent, or contain a very considerable proportion of that fluid; not unfrequently the cyst is covered internally by a layer of calcareous matter, to which similar particles are loosely attached. Sometimes, in consequence of irritation, organisable matter is poured out on the inner surface of the cyst, adheres firmly to its inner surface, and is often disposed in concentric laminæ.

Sometimes, though rarely, the most prominent parts of the tumour ulcerate, and on the exposed surface is deposited a substance of semifluid consistence and gelatinous appearance, which afterwards increases in density, and ultimately assumes all the characters of horn. This hard excrescence in some instances increases only to a slight degree, and afterwards remains stationary; in others it attains a large size, and occasionally assumes a curved or tortuous form, like that of the horns of inferior animals. Horns are generally met with on the forehead, and the scalp may be said to be their seat. The largest which I have seen, measured seven inches in length, and two in circumference; but others have been removed still larger.

In many encysted tumours, hairs grow from the internal membrane of the cyst, often numerous, and are generally found in those situated on the eyelids; in some the hairs are destitute of bulbs, lie loose within the tumour, and are often rolled into a globular form. The adhesions of these tumours are in general very slight and easily broken up, but when seated amongst tendons, or in unyielding parts, they are often extremely firm. Violent inflammatory action may follow injuries of the tumours, or the making of even minute openings into them; suppuration occurs, the discharge is thin, fetid, and often bloody; there is much pain, and frequently severe constitutional irritation. Occasionally a fungus, bleeding or not, is protruded through the aperture; more frequently, however, the opening heals, and the tumour remains as before. External injuries sometimes appear to check the secreting action, and to excite the absorbents to remove the morbid growths, and this with or without rupture of the cyst. Thus, in the case of an encysted tumour the size of a hen's egg, on the external lateral ligament of the knee joint, free and pretty rough manipulation was necessary to ascertain its nature and exact situation; in consequence of which, the tumour gradually disappeared, and no traces of it remained twelve days afterwards. Others of less size, I have known to disappear in a much shorter period.

OF TUMOURS OF BONES.

The vascular action of bones, in their healthy state, is feeble, but, as in other feeble parts, it is easily excited, and disease of an obstinate and unyielding nature is apt to follow.

The morbid growths vary much in texture. The most frequent are the osseous, or those of the same structure with the original bone; but even these differ much in the density and arrangement of their particles: they have been termed *exostoses*. They may be of great density, and are then called the hard, or ivory; these never attain a large size, seldom exceed that of a bean, have a smooth and polished surface, and are of a flattened and hemispheroidal form, their greatest circumference being at the base; they occur in many of the bones, but generally in those of the cranium and face.

Others, being of a more loose and spongy texture, have been called cancellated. These are commonly formed by the bones of the extremities, and often attain a very considerable size; they grow from the periosteum, or from the outer surface of the bone, and are then covered by an expansion of this membrane. Sometimes they adhere by a narrow neck, and expand into a bulbous form, so that they can be very readily removed by operation, and are very apt to be broken off by external injury. Others have a broad and firmer attachment, and are of an irregular shape, often projecting in the form of a large spicula, and at other times assuming a somewhat stalactical appearance. Such frequently prove the source of much inconvenience, by impeding the motions of the muscles, or disturbing the functions of any adjoining organ. They possess no malignant disposition, but are under the same laws, though perhaps in a less degree, with their parent trunk.

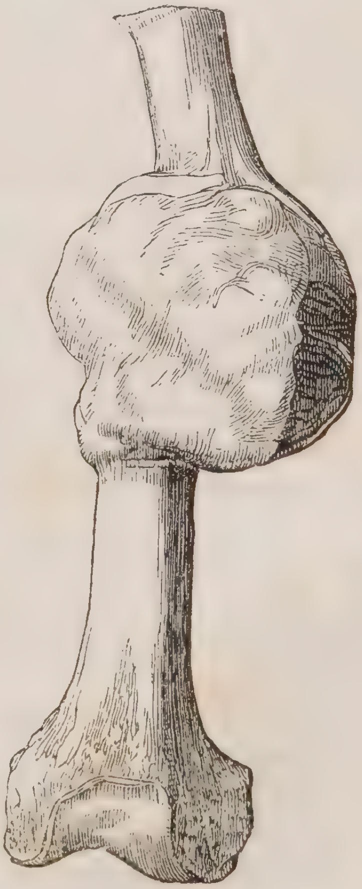
On making sections of exostoses, and of the bones from which they arise, some appear to be mere enlargements or processes of the parent bone, the cancellated tissue extending itself so as to form the interior of the exostoses, whilst the exterior resembles a proportionate extension of the outer lamina. Others are evidently formed by the deposition of osseous matter externally to the outer lamina, many being dense and compact throughout, others containing an internal cancellated structure, but which is not continuous with that of the bone, as it is separated by the natural outer lamina. Their formation appears similar to that of the fœtal bones: a glutinous matter is effused, becomes dense, and is converted into cartilage; bloodvessels shoot into it, ramify throughout its whole structure in a radiated form, and deposit osseous matter. This deposit increases, and extends from a central nucleus towards the circumference; the cartilage is in part absorbed, and the new structure becomes osseous, and similar to the original tissue by the vessels of which it was formed. These tumours, even when they have attained a large size, contain a mixture of bone and cartilage, covered by a dense fibrous investment. The bony matter is arranged in spicula, adhering to the surface of the shaft or head of the bone, and projecting into the morbid mass: the spaces are filled up by a cartilaginous substance. The growth is sometimes rapid, and the tumour soon becomes troublesome from its immense size.

Frequently a bone is much enlarged throughout its whole extent, or the greater part of it, and presents a cancellated texture: sometimes, also, it is much thickened, and, at the same time, of great solidity; but such enlargements cannot be considered as tumours of bones, or exostoses, any more than those nodules of new osseous matter, which are effused in consequence of inflammation of the osseous tissue. The most frequent cause of exostoses appears to be external injury; their progress is slow, attended with slight dull pain, and often accompanied with no inconvenience; their existence can be readily ascertained, a hard and immoveable body being felt where no bone exists in the natural state of parts; but when the tumour projects into an internal cavity, the diagnosis is rendered obscure. Most frequently, they remain stationary, after having attained a certain size, and are productive of little inconvenience, the surrounding parts having accommodated themselves to the new formation. Occasionally, suppuration occurs in the soft parts, the matter comes to the surface, and a troublesome abscess is formed.

To this class of tumours would I confine the term exostosis, not including those consisting of softer materials, and possessed of a less benign action.

OF OSTEOSARCOMA.

By this term is meant, an enlargement and alteration in the structure of a bone, accompanied with the deposition of a morbid sarcomatous substance internally. This morbid change appears to be the consequence of inflammation, and its origin is frequently attributed to some mechanical injury or local irritation. In the commencement of the disease, the bone is slightly enlarged, perhaps somewhat thickened in its outer laminæ; and on a section of it being made, is found to contain a brown fleshy substance instead of its cancelli. This appears to be formed in consequence of a morbid action, perhaps inflammatory, of its internal structure. By the pressure of the new formation, the parietes of the bone are pushed outwards, in some cases attenuated, in others thickened by deposition of new osseous matter, inflammatory action having been induced by the pressure. As the internal formation increases, the parietes are extended, and are generally much attenuated, becoming in some places thin as paper, and diaphanous; they also would seem to lose a portion of their earthy matter, for they are flexible, somewhat elastic, and not of their usual density. Frequently they are in several places deficient, and their situation occupied by a membranous expansion, sometimes thin and delicate, but mostly thick and ligamentous; in some cases, the external lamina appears to be converted into a substance resembling the internal growth, with which it is continuous. The investing periosteum is much thickened, and its bloodvessels are enlarged. Occasionally, the deficiency of the bone is not supplied by any membranous expansion, and the morbid growth protrudes, fungous. The internal structure varies much in appearance; generally it is brown and soft, in some places broken down and mixed with a dark-coloured fluid, or with gelatiniform matter; sometimes it is much more dense, and resembles cartilage; in others, the cavity contains an ichorous fluid, mixed with small portions of more solid matter; in the advanced stage of the disease, the contents are often of the encephaloid nature, either in its homogeneous and solid form, or softened, broken down, and mixed with blood, or with a lard-like substance. Sometimes the cancelli of the bone are not destroyed, but extended, forming numerous cavities of considerable size, in which the morbid matter is deposited; in other instances, there is no appearance of cancellated structure, and the diseased mass contains rough osseous spicula, some detached, some loosely connected with each other, and others projecting from the inner surface of the bony parietes of the tumour. At the commencement of the disease, the patient feels acute pain in the part, the constitution is disturbed; afterwards, the pain becomes more dull, and there is a considerable swelling externally, which feels hard, and slightly elastic; in the advanced stage, the pain again becomes severe, and is of a lancinating kind, and the system is much deranged, the tumour is softer, often presents a sense of distinct fluctuation, and on, being freely handled, is found to crepitate, in consequence of the loose spicula of bone rubbing upon each other. Ultimately, the integuments become tense, livid, or dark-red, ulcerate, and allow a portion of the softened tumour to protrude, in the form of a frightful fungus; there is profuse discharge, thin, and sometimes bloody; there is much constitutional irritation, and the patient is greatly exhausted. Not unfrequently, during the progress of the disease, especially in the long bones, fracture occurs at the diseased part, either from external injury, or sudden muscular exertion. This occurred in the case from which the specimen here delineated was obtained some months before the patient submitted



to amputation. The morbid structure had not broken through its periosteal investment. The muscles and their interfilamentous tissue were sound. The patient remained free from any return of the local disease. Bones so affected, when broken, do not unite, the movement of the loose and rough ends is a cause of much irritation : inflammatory action is kindled in the morbid structure, suppuration occurs, the integuments give way, and ulcerate to a greater or less extent, and the advancement of the disease is thus much hastened. The tumour may be safely pronounced malignant ; it is true, that for some time it shows no tendency to involve the adjoining soft parts, further than by the effects of inflammation induced by its pressure ; but then it is limited by the external lamina of the bones, which confines it to the tissue in which it originated; but after this barrier has given way, the tumour projects through the aperture, contaminating the adjacent soft parts, imparting to them a morbid action, and extending also in the cancellated tissue of the shaft of the bone. In some cases, the integuments are tense and discoloured, with large vessels running on their surface ; the tumour feels soft and fluctuating, though the skin may not ulcerate till long afterwards. Perhaps the most common seat of this disease is the under-jaw, but it may occur in any of the bones; when it has been of chronic duration, not one bone but several are affected; and in one case which I saw, the disease commenced in the under-jaw, which it deformed to a frightful degree ; almost every bone in the body was similarly, though less extensively diseased ; this could be readily observed during the life of the patient, and was confirmed by dissection. From this, it appears, that the affection is not only dependent on local causes, but connected with a morbid state of the constitution, predisposing to it, and cooperating with its exciting cause.

There are other tumours of bones in some degree resembling, which do not strictly come under the term Osteosarcoma. Some are wholly cartilaginous, the disease commencing in their centre, and involving their entire substance, emitting a gelatinous fluid when cut, but containing no cells ; others are not uncommon, partly osseous, and partly cartilaginous, containing cells filled with a glairy fluid ; others are composed of cartilage, intersected with dense fibrous matter, in a greater or less proportion. In fact, the individual tumours of bones vary as much from one another as those of the softer tissues; scarcely two are alike in their progress, action, or anatomical characters. Irregular spicula of bone are found in many parts of their structure; in the same way that portions of bone often exist in tumours having no connection with the bones; in many places they are softened and broken down, the partitions between the cells are destroyed, and these contain a pulpy mass of a dark sanious appearance. On making a section, they are observed to be continuous with the interior of the bone, which is converted into a substance similar to themselves, or is of a more soft and medullary character. The external surface becomes tuberculated, the integuments are painful, and changed in appearance ; they ulcerate, the tubercles burst, the discharge is thin and bloody, the ulceration extends; not unfrequently a fungus protrudes, and occasionally bleeds; this may slough, the tumour becomes farther exposed, portions of it die, and are discharged, unhealthy fungous granulations project from amongst the cancelli of the tumour, and emit a sanious putrid discharge, often bloody; severe constitutional irritation accompanies this state, the patient becomes hectic, is much exhausted, and sinks, unless the morbid parts be removed. There are also tumours of bones, composed partly of cartilaginous or fleshy, or partly of osseous matter, arising from the periosteum and outer shell of the bone, and these often acquire a great magnitude before the diseased mass reaches the interior or medullary part of the bone.

SPINA VENTOSA.

By this term is understood a mere expansion of a bone from a collection of matter in its substance. The disease may be produced by external injury, exciting inflammation, and consequent suppuration, in the cancellated tissue; or in a weakened and unhealthy constitution, the action may be of a chronic nature. The fluid accumulates, the cancelli are broken down, and the much-attenuated parietes of the bone are pressed outwards. Occasionally inflammatory action is excited on the external surface, from the pressure of the contained fluid, and minute nodules of bony matter are effused, as if nature endeavoured to strengthen those walls which are daily becoming thinner, and more incapable of supporting the weight of those parts which they encircle. The disease differs from Osteosarcoma in the contents being uniformly fluid, generally purulent, though often mixed with more liquid and dark-coloured matter, or with a curdy substance — in the gradual extension of the bone — in no fungus protruding after a portion of the attenuated bone has given way, matter being discharged as from a common abscess; and in the tumour not possessing a malignant disposition. At first there is considerable pain in the part whilst the matter is forming, but afterwards it becomes much less acute, and in many instances there is no inconvenience, except from the bulk of the tumour. Often after having reached no very large size, it becomes stationary, neither recedes or enlarges, and all painful sensations cease; in other cases it enlarges gradually, attains an enormous size, and produces much disturbance of the constitution; but in such instances the patient is generally weak and cachectic. The largest tumour of this species which I have seen, occurred in the lower part of the femur. It measured, in breadth, seven inches, in length, seven and one-fourth. The parietes were composed of an extremely thin lamina of bone, and in this there were numerous deficiencies supplied by delicate ligamentous matter; its cavity was divided into several compartments by thin septa, partly osseous and partly membranous. A representation of the femur so affected is given in the *Practical Surgery*, p. 350. The patient was a boy of twelve years of age; amputation of the limb was earnestly advised, the friends objected, he died hectic.

ANEURISMAL TUMOURS.

Besides these tumours a species of an anomalous character is sometimes met with, appearing to arise from an aneurismal or varicose state of the venous radicles or capillaries, and partaking somewhat also of the nature of fungus hæmatodes.* I shall detail shortly the

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* [The first accurate account of *osseous aneurism* was published in 1826, by Mons. Breschet, in the second volume of the "*Répertoire Générale d'Anatomie et de Chirurgicale.*" It has since been noticed by other surgeons, particularly by Professor Lallemand of Montpelier, and Mr. Bell of Edinburgh, and there is reason to believe that it is of more frequent occurrence than is generally imagined.

The disease is most commonly seated in the head of the tibia. It has been observed also in the scapula, as in the case mentioned in the text, the femur, wrist, and ankle. The male is more liable to it than the female, and it rarely makes its appearance until after the period of puberty. The cause of the disease has not been satisfactorily explained. In some cases it is produced by external violence, as a blow or fall; in others, especially when seated near a large joint, it is traceable to gouty and rheumatic affections.

The enlargement, even in its early stage, is tense and painful; being attended with distention of the superficial veins, swelling of the surrounding structures, and slight discoloration of the skin. In a short time a deep-seated pulsation, or throbbing, synchronous with that of the left ventricle, and similar to what is witnessed in some erectile tumours, may be perceived in the affected part. In the advanced stage of the malady the beating is accompanied by a sort of undulating movement, and is easily interrupted by compressing the main artery of the limb, between the tumour and the heart. The enlargement varies in size. In a case mentioned by Mr. Bell, it was more than nine inches in circumference, by upwards of six in length. In some instances, pressure applied to the tumour with the finger imparts a peculiar crackling sensation, not unlike that of dry parchment or an egg-shell. The soft parts around the disease are generally œdematous, the whole limb is apt to be swollen, and the motions of the contiguous joints are constrained and painful. Towards the last the general health always seriously suffers.

On inspection, the outer table of the bone is found to be considerably attenuated, in many parts destroyed, and in some so flexible and elastic as to be bent with the same facility as cartilage. Frequently the bone is extremely brittle, and may be crushed like an egg-shell. The areolar texture is partially absorbed, and the medullary canal filled with coagula, which are often arranged in concentric layers, as in old aneurismal sacs in other situations. The investing membrane in the immediate vicinity of the disease is thick-more important circumstances of one case. The patient, a lad aged sixteen, was admitted into a public hospital on the 7th of November, 1819, on account of a tumour over the left scapula. It was there deemed imprudent and inadvisable to attempt operation; and, after the application of leeches, he was dismissed, at the end of eight days. He then applied to me. The tumour was very large, hard, inelastic, firmly attached to the left scapula, and extending from its spine over all its lower surface. It also stretched into the axilla to within half an inch of the nervous and vascular plexus, and a large arterial trunk could be felt along its under surface. The arm hung useless, and, from the wasting of its muscles, was hardly half the size of the other. According to his own account, the uneasiness produced by the tumour was trifling when compared to the lancinating and excruciating pains in the limb. On attempting to move the tumour independently of the scapula, crepitation was distinctly perceived, as if from fracture of osseous spicula. A tumour was first perceived about three months previous, situated immediately below the spine of the scapula, about the size of a filbert, of a flat form, and attended with distinct pulsation; it had subsequently increased with great rapidity. About ten days before his admission into the hospital, it had been punctured; nothing but blood escaped. It was evident, from the rapid growth of the tumour, and the severity of the symptoms, that the patient would soon be destroyed if no operation were attempted. There were no signs of evil in the thoracic viscera, the ribs and intercostal muscles were unaffected; though the tumour was firmly fixed to the scapula, yet that bone was moveable as the one on the opposite side, and the vessels and nerves in the axilla were quite unconnected with the swelling. The operation was commenced by making an incision from the axilla to the lower and posterior part of the tumour. The latissimus dorsi was then cut across at about two inches from its insertion, so as to expose the inner edge of the tumour, with a view to tie the subscapular artery in the first instance; in this, however, I was foiled, owing to its depth. The dissection was proceeded with to where the branches from the suprascapular were expected to enter. In detaching the tumour from the spine of the scapula, the knife and fingers suddenly dipped into its substance. This was attended with a profuse gush of florid blood, with coagula; by a sponge thrust into the cavity, the hemorrhage was in a great degree arrested; at the same time an attempt made to compress the subclavian failed, on account of the arm being much raised to facilitate the dissection in the axilla. The patient, exhausted, made some

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ened, as well as preternaturally dense and firm, and the vessels ramifying through the tumour are greatly enlarged.

The only effectual remedy for this disease, provided its location be favourable, is amputation. In the early stage relief may possibly be afforded by securing the main artery of the limb. Lallemand relates a case in which ligature of the femoral artery completely arrested an aneurismal affection of the head of the tibia; but this must be regarded as an exception to the general rule. — Ed.]

efforts to vomit, and dropped his head from the pillow, pale, cold, and almost lifeless. Then only the nature of the case became apparent. The sponge being withdrawn, one rapid incision completely separated the upper edge of the tumour, so as to expose its cavity; and, directed by the warm gush of blood, a large vessel in the upper corner, which with open mouth was pouring its contents into the sac, was immediately secured. The coagula being removed, by dissecting under the finger, the subscapular artery was then separated, so that an aneurism needle could be passed under it at its origin from the axillary, and about an inch from the sac. After securing this and two other large vessels which supplied the cavity, the tumour was dissected from the ribs without further hemorrhage, cutting the diseased scapula and the under part of the sac. It was then found necessary to saw off the ragged and spongy part of the scapula, leaving only about a fourth part of that bone, containing the glenoid cavity, processes, and half of its spine. The edges of the wound were brought together, and the patient lifted cautiously to bed. At this time he was pale, almost insensible, and without any pulsation perceptible through the integuments in the greater arteries, though the ends of the vessels in the wound beat very forcibly. Stimuli were employed externally and internally; in the evening his pulse at the wrist was ninety, and soft.

The sac of the tumour was composed of bony matter, containing little earth, and arranged in strata of short fibres pointing to the cavity. Its outer surface was smooth, and covered by a dense membrane; whereas the inner, to which so equable a resistance was not afforded, was studded with projecting spicula. The lower part of the scapula, partially absorbed, lay in the middle of the sac, covered by the remains of its muscles and coagula. Very large vessels were perceived ramifying on the surface of the tumour.

The patient made a rapid recovery, and the wound all but healed. A fungus, however, began to appear in about six weeks, which grew rapidly. This was removed, and the bone cauterized with little good effect. The tumour was soon reproduced. It was proposed to remove the remainder of the scapula with the extremity, as the only chance, though perhaps a slight one. This was objected to, and he died about five months after the operation, worn out by hemorrhage and profuse discharge.

The diseased parts presented the following appearances. Portions of the acromion process, superior costa, and spine of the scapula, were of their natural appearance. But the coracoid process, the glenoid cavity, and the cervix, were entirely destroyed, and their situation occupied by an irregular broken-down tumour, consisting of osseous spiculæ, and cancelli, irregularly disposed, and forming cavities which were filled with blood, partly fluid and partly coagulated. The head of the humerus was extensively absorbed. The articulating cartilage was almost entirely destroyed, particularly on the inner side, where a large portion of the bony matter had also been removed. The ulcerated surfaces were of a dark, bloody colour.

[HYDATIC TUMOURS.

Another disease of the bones which ought to be introduced here is the development of hydatids, which I described twelve years ago under the name of *osteo-hydatidic* tumours. The seat of this affection is not confined to any particular class of bones; though the long are perhaps most prone to it. Its precise nature and origin have not yet been determined; nor are its symptoms such as to enable us, in the present state of our knowledge, to distinguish it from exostosis, osteosarcoma, and other maladies. Its progress is commonly slow, the surface of the tumour is smooth and regular, the skin exhibits no unusual appearance, and the adjacent textures rarely participate in the morbid action. The hydatids, usually of a globular figure, vary greatly in size and number, and are generally filled with a thin, limpid fluid. They appear to be of the nature of acephalocysts. The prognosis unfavourable, owing to the difficulty of destroying these parasites, and their constant tendency, when interfered with, to reappear.

As soon as the true nature of this tumour is ascertained it should be laid freely open, its contents turned out, and the sac destroyed. For this purpose the sides of the cavity should be seared with the actual cautery, or touched with some of the more powerful escharotics, as the nitrate of silver, or the caustic potash. If these measures fail, and the disease involve the whole circumference of the bone, nothing short of amputation will suffice. This was successfully resorted to in one of the cases which came under the observation of Mr. Lucas of London.]

TREATMENT OF TUMOURS.

It may be observed generally, that no benefit can be derived from external applications to tumours, such as friction with liniments or ointments containing iodine, mercury, &c.; and that, therefore, it is injudicious to employ such temporising measures; for though a tumour at its commencement appear to be of a very harmless nature, yet it may soon assume a most malignant character. If an apparently simple tumour increase, and exhibit symptoms of inflammation, it will perhaps be advantageous to apply leeches, to arrest that incited action which affords the accession of new materials; this, however, cannot check the morbid activity inherent in the new formation, though it may hold the growth in check a little. If a tumour is to be removed by external applications, it is evident that these must be such as shall prevent the deposit of new matter, and allow the absorbents to remove that which already exists; for absorption is always going on in a tumour, though it leaves no evidence of its progress, on account of the deposition of new matter exceeding the removal of the old. I must say that I am unacquainted with any remedies capable of performing the above indication. The removal of a swelled gland may occasionally be accelerated by such means when stationary, or on the decline, and before cheesy tubercular unorganized matter is infiltrated into its texture; but to trifle so with a new and independent growth is altogether absurd. The knife only is to be depended on.

Many of the tumours first described have no malignant disposition originally, and only require surgical interference when they produce deformity or inconvenience from their bulk. Yet even these ought not to be allowed to attain any great size, however indolent they may appear at first, and however little pain they may produce; for there is always a danger of their assuming a malignant tendency, or forming connections with important parts, so as to render their removal either altogether impracticable, or at least attended with much difficulty. Tumours of every kind, when seated near important organs, must be early removed. Glandular tumours, however, even when of great size and long continuance, are not to be rashly interfered with, when they arise from irritation in the neighbourhood.

Those in which it is feared that malignant action has commenced cannot be trifled with; and the only means which afford a chance of the patient's being effectually delivered from them is an operation. With a view to their complete extirpation, the external incisions ought always to be free, so as to admit of the after-dissection being easily and rapidly performed: they ought also to be made in the direction of the muscular fibres, whether these lie above or beneath the tumour. In this way the margins of the wound are easily brought into apposition, and there retained; whereas, if the fibres be divided transversely, the wound will gape, and union by the first intention be rendered absolutely impossible. If there is no reason to suppose that the tumour is malignant, little or no integument ought to be removed, unless the growth is of a large size; but, when malignity is dreaded, all the discoloured, tense, and adherent integument, all that is permeated by dilated and tortuous vessels, ought to be taken away, and the incisions made at a distance from the disease. In all cases they ought to commence at the point where the principal vessels enter; these are thus divided at the outset, can be readily secured by ligature, or by the fingers of an assistant, and the dissection is proceeded in without risk or interruption from farther hemorrhage. If the opposite course be pursued, the vessels will be divided two or more times during the operation, and thus the performance of it will either be delayed by the application of numerous ligatures, or will be attended with a considerable loss of blood. After the tumour has been exposed it ought to be principally detached in one direction, as in this way its removal will be sooner accomplished, and not first cut on one side and then on another. If malignant, great care should be taken that all the diseased mass be removed, for a minute portion remaining will form a nucleus in which similar diseased actions are certain to arise; in most instances, it will be prudent not only to remove the parts actually diseased, but those also which are in immediate connection with the tumour, though at the time they appear healthy. All important parts must be carefully avoided. After removal of the mass, and the complete cessation of bleeding, the edges of the wound must be approximated, so as to favour union by the first intention; if this fail, granulation must be promoted, and the wound dressed according to the particular circumstances of the case. All operations on malignant tumours, in their advanced stages, are unwarrantable; they are necessarily painful and severe, and cruel because unavailing; they often, indeed, expedite the dissolution of the patient. If the integuments over the tumour have ulcerated, and if the lymphatics in the neighbourhood are diseased, the disease if removed will certainly be reproduced, and the succeeding tumour will be still more malignant. The operation ought, if at all, to be performed when the disease is in its incipient state, for then only can success be expected.

Exostoses need not to be interfered with, unless they are the source of much inconvenience, either from their size and form, or from their having been detached, and lodged amongst the adjacent soft parts. If loose, they can be removed in the same way as any other extraneous body; if firm, their attachment must be divided by a saw, or by cutting pliers, close to the bone from which they spring. Sometimes, as in the scapula or other flat bone, a portion of the original bony tissue can be cut out along with the new growth, and this renders the chance of any return of disease much less likely.

Osteo-sarcomatous tumours are to be taken away, along with the part of the bone in which they are imbedded, and, if possible, before the integuments have ulcerated. The incisions must be made, and the bone sawn, at a healthy part. The removal of the entire bone in which the disease has commenced, when practicable, will afford a still better chance of immunity from farther disease.

In spina ventosa more is seldom required than to lay open the cavity, give vent to the matter, and then treat the case on the same principles as in abscess of the soft parts. The cellular tumours, partly cartilaginous, partly osseous, ought not to be permitted to remain; the operation can generally be done without much difficulty; and thus the danger of their degenerating avoided. Frequently, however, a considerable part of the bone must be removed along with the tumour, since the neighbouring tissue is generally softened, and intimately adherent to the diseased part, which it somewhat resembles in structure.

In general, regular dissection is unnecessary in the removal of encysted tumours. An incision is made, or an elliptical portion cut out; the contents escape, and the cysts, being then laid hold of by dissecting forceps, is readily separated. In some situations, as on the eyelids, under the tongue, or amongst tendons, the sac, which is thin, is not so easy of extraction; it is then inseparable, either naturally, or from previous inflammation. Caustic is used with safety to destroy those parts which cannot be detached, and for this purpose the potass is to be preferred. When, however, the tumour is large, a part of the integuments covering it must be removed, otherwise a large cavity will be left, in which pus might accumulate. In this case, the base of the tumour is to be surrounded by two elliptical incisions, and the cyst dissected out entire, leaving only integument sufficient to cover the exposed surface. In the smaller tumours, it is vain to attempt regular dissection; a portion of the cyst will be left, and the disease reproduced: whereas, by using the potass, the operation is much more speedy, and always successful. The making a minute aperture, and squeezing out the contents, is at best but a palliative measure, and is often followed by severe constitutional disturbance.

OF WOUNDS.

These vary in extent and nature. The instrument by which they are inflicted, the violence attending the injury, and the nature and importance of the parts divided, or in the neighbourhood of the wound, must all be attended to, for, from an accurate knowledge of these circumstances, the treatment of the case comes to be conducted accordingly. Wounds are divided into incised, punctured, bruised, and lacerated; that is, into such as are inflicted by a sharp-edged, sharp-pointed, or an obtuse body. In the first kind, there is greater or less effusion of blood, according to the size and number of the vessels divided. Some extend but a little way beyond the subcutaneous cellular tissue, and are consequently attended with but slight bleeding; others penetrate to a greater depth, and occasion hemorrhage from a large vessel, or other alarming symptoms, by having reached some important organ; others, though not of so great a depth as the former, may still, on account of their mere extent, be accompanied with very considerable loss of blood from a number of small branches. It is seldom that fatal effects immediately follow external wounds; but they may and do occur when bloodvessels of the first class only are cut. They are most likely to prove suddenly fatal when the arteries are only partially divided, and when the large veins accompanying them are also involved. When the artery is cut through, its extremities retract, effusion takes place into the sheath and compresses the orifice; the formation of a coagulum within the vessel is thus promoted, and the hemorrhage arrested. But, when a portion only of the circumference is divided, the blood continues to flow through the aperture and onwards, as if into a smaller ramification of itself, no retraction or contraction of the vessel can occur, coagulation is slow, and the bleeding profuse. I have seen a wound of so small a vessel as the internal mammary prove almost instantaneously fatal. Wounds of the large internal vessels for the most part prove immediately fatal; as wounds of the heart, or the large vessels passing to and from its cavities, at the root of the lungs, or at the upper part of the liver. When the heart, or the vessels within the pericardium, have been divided, it can be readily understood how life should be immediately destroyed, since the blood effused into the cavity of the pericardium by its pressure completely arrests the action of the heart. But occasionally punctured wounds, in such situations, have not been followed by instant death. In such cases, alarming symptoms occur at the time, but subside, and the patient may for some time suffer no uneasiness, but afterwards expires suddenly during muscular exertion, or perhaps in a fit of violent passion. Blood must have been effused into the pericardium at the first, causing symptoms of, or actual, syncope; but then the aperture in the vessel had become obstructed by coagulum before blood had been poured out in such quantity as to effectually prevent the actions of the heart; at a future period the coagulum gives way, and the subsequent effusion is limited only by the pericardial cavity being completely filled. In wounds, hemorrhage is the symptom which most alarms the by-standers, and which demands immediate attention; but, to operate successfully, the surgeon must divest himself of all fear, and learn to look boldly on the open and bleeding mouths of arteries. Effusion of blood ceases spontaneously, even from considerable vessels, on faintness supervening, and thus many lives are saved; but as soon as reaction commences it generally recurs, and may prove fatal, unless proper measures be resorted to.

When an artery is divided, its extremity retracts within the sheath, it also contracts, and coagulation occurs; thus the orifice is obstructed, and a temporary barrier formed to further hemorrhage. The tube, however, is permanently closed by effusion of lymph from its orifice, and consolidation of the surrounding parts.

The circumstances which follow division of an artery are these: — The immediate effect is retraction of its ends within the investing sheath, and a simultaneous contraction of the coats, so as to diminish the calibre. From the superior orifice there is necessarily a profuse flow of blood, which is discharged through the sheath that formerly enclosed that part of the vessel which has retracted. After considerable effusion of blood, the flow becomes slower and less profuse; particles of blood adhere to those filaments which previously connected the artery to the sheath, but which were lacerated by the sudden retraction of the divided extremity; these particles coagulate, and lessen the canal through which the blood is discharged, whilst they present an irregular surface, on which the blood continues to be deposited and to coagulate; and thus the aperture in the sheath is ultimately closed. This external coagulum is found to commence at the extremity of the artery, where it is of a cylindrical form, and shuts up the mouth of the vessel; it then extends along the canal in the sheath, frequently assuming a conical form; and, if a free discharge has been allowed for the blood, it will terminate at the cut margin of the sheath, otherwise it will be found continuous with the coagulum blocking up the external wound. Also, when hemorrhage has been resisted by the shutting of the external wound, blood is infiltrated into the cellular tissue around the bleeding point, and there coagulates; but this circumstance can be productive of little or no pressure on the parietes of the vessel, so as to assist those other natural means which obstruct it. The flow of blood through the divided vessel being prevented, the circulating fluid necessarily passes through the nearest collateral branches, leaving the blood in the extremity of the larger trunk in a state of comparative rest; consequently, coagulation occurs in this situation. The internal coagulum, however, is small, and not sufficient to occupy completely the cavity of the vessel; it is of a conical form, its apex being towards the heart, and opposite to the first collateral branch, and its base resting on the external coagulum, and there adhering to the internal surface of the artery. But, whilst this latter process is advancing, the capillary vessels supplying the cut margins of the artery have begun to act; they throw out coagulating lymph, and continue to do so until their secretion has completely filled the vessel immediately opposite to its divided margins; thus a third and more effectual coagulum is formed, — one of plastic matter, situated between the external and internal coagula of blood, and in general closely adherent to them. Lymph is also effused externally to the artery and its sheath, forming a dense stratum, which separates the extremity of the vessel from the external wound; it becomes organised, forms granulations, and thus the parts are consolidated, and the wound cicatrised. When the artery is permanently obstructed by the adhesion of its cut margins, the external coagulum can be dispensed with, and is gradually absorbed. Afterwards all the newly formed parts are condensed, and diminish in size; the artery contracts, its internal surface finally embraces the coagulated blood which lay loose in its canal; its coats appear to be thickened, and it is firm and hard. Ultimately, in consequence of the continuance of absorption, it becomes much more attenuated, so as scarcely to differ from the surrounding cellular tissue. Similar changes occur in the lower extremity of the divided artery; in general it retracts farther, its orifice is more contracted, and, the flow of blood being much less profuse than in the superior, the natural means for its temporary closure are sooner accomplished. When an artery has been divided close to the origin of a collateral branch, no bloody coagulum can form internally, for the blood in that situation is necessarily in a state of constant motion.

If the hemorrhage is suppressed artificially, either by ligature, or by otherwise well-applied pressure, no external coagulum is formed; there appears only the internal bloody coagulum, the lymphatic effusion, and consolidation of the compressed part. The natural contraction and retraction cannot occur in vessels partially divided; hemorrhage, therefore, is more violent and dangerous from a partial than from a complete section. Again, transverse wounds are more dangerous than longitudinal; in the latter, the edges of the wound are spontaneously approximated on account of the structure of the vessels, whilst, from the same cause, the margins of the latter continue separate, and, in fact, the aperture is a complete circle; the lips of an oblique wound will be more or less apart, in proportion as it approaches to the transverse direction. When an artery has been punctured, the wound in the sheath perhaps does not correspond with that in the vessel; blood, therefore, accumulates between the vessel and its sheath, and there coagulates. The wound is thus compressed, its edges kept in contact, and the farther escape of blood prevented; the lips of the incision are then agglutinated by effused lymph, and cicatrisation occurs. This, however, cannot be expected to take place unless methodical pressure has been applied from the first. Even from small punctures blood is effused under the sheath and into the neighbouring cellular tissue, rapidly, and in such quantity as to prevent adhesion. The effusion continues, and a false aneurism is formed. If a considerable part of the circumference has been divided, the lymph may be, and generally is, superabundant, and often to such an extent as to close up the canal of the artery at that point; but, if the aperture is minute and in a longitudinal direction, lymph will seldom be effused in greater quantity than is sufficient for the cicatrisation; and, though it should be superabundant, it is afterwards removed by the absorbents. In all cases, the cellular tissue round the wounded point is much thickened and condensed by the deposition of lymph, but this gradually disappears after cicatrisation has been completed. Sometimes, and generally when the wound has been transverse and large, the process of adhesion is disturbed, and suppuration occurs; in this case the wound in the vessel communicates with the fistulous track in the externally effused lymph, and may be the source of troublesome hemorrhage. In other instances of extensive transverse wounds, the undivided slip ulcerates, and the artery becomes obliterated, by means of the same natural processes that occur in complete division. In cases of laceration of an artery, when its coats have been forcibly torn rather than divided, little or no bleeding takes place. The vessel retracts; the lacerated margins of its inner coat become puckered up, so as to contract greatly the orifice of the vessel; the lacerated sheath is pulled out to a point, and closed at a little distance from the divided inner coats. If a large artery is torn asunder in the dead body, this stretching out and contraction of the sheath will prevent injection passing; in short, the immediate effects of the injury are such as to favour the instant formation of coagula, by which the hemorrhage is arrested until the orifices of the vessel be permanently closed by the adhesive process. Thus, in instances where the whole of an extremity has been torn off, the patients have generally lost but a very small quantity of blood.

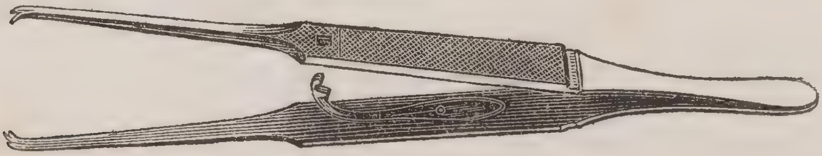
From wounds of veins the blood flows, not in a sub-saltatory but in a uniform stream: its colour is dark, and the flow is easily suppressed. The common opinion is, that to place a ligature on a vein is dangerous, and to be scrupulously avoided. The process of reparation, besides, in a wounded vein, is different from that in an artery. Veins are less disposed to the secreting action by which adhesion is perfected; and, when inflamed, the inflammation is extremely apt to extend along the coats of the vessel; which latter circumstance has been ascribed to the great proportion of cellular tissue in their coats. When punctured longitudinally, the lips of the wound remain in contact, and cicatrisation, by means of effused lymph, is soon effected; in fact, the wound heals by the first intention. But if opened obliquely or transversely, not to a great extent, the immediate result is discharge of blood, and, when this has ceased, a coagulum forms in the wound, the margins of which remain separate; and this coagulum generally communicates with blood effused into the sheath of the vessel. After some time, the lips of the wound, encircling the coagulum which occupies the aperture, and which has temporarily averted the hemorrhage, become somewhat turgid, and increased in vascularity; they then appear to assume a secreting action, by which a membranous substance, of extreme delicacy, is produced; and the extent of this membrane is increased until it form an expansion, investing the outer surface of the clot; it then becomes thickened, by addition of matter, similar to itself, from the recent vessels which ramify in it. At the same time it forms adhesions to the surrounding cellular tissue, and resembles the original tunics of the vein. After being consolidated, so as to prevent the flow of blood through that part, the coagulum, formed to arrest the hemorrhage until a more complete barrier should be furnished, is gradually absorbed. But the membrane long remains smooth, thin, and diaphanous, and can be thereby readily distinguished from the original coats. This reparative process is much longer in being finished than the corresponding one in arteries; and, from what has been stated, it is evident that the two actions differ in other respects than the time requisite to complete them. When a vein has been completely divided, the extremities are closed by means similar to those which have been already detailed in regard to arteries.

In many, nay in most, instances of hemorrhage from a wounded artery, the surgeon cannot wait for the natural processes by which the flow of blood is arrested, but must have recourse to immediate and certain means. In division of the smaller arteries, or in minute wounds of the larger, pressure, well applied, will often be sufficient. In both cases it immediately stops the flow: in the former, it prevents the blood from penetrating into that portion of the sheath which has been vacated by the retracted artery; and it being thereby confined, and kept in a state of rest, coagulation soon takes place. At the same time, the compression brings the divided margins of the vessel into close apposition, and thereby permanent closure, by adhesion, is quickly accomplished. In the latter, the mere circumstance of the escape of blood being prevented, naturally hastens the closure of the minute aperture by the natural process; and, if the compression be accurate and very firm, the opposite surfaces of the vessel, being brought in contact, may adhere, and the canal be obliterated at the wounded point. It is obvious that, in this latter class, pressure can only be of advantage immediately after the infliction of the wound, and not when blood is extravasated to a great extent.

Pressure may be used along with styptics, or along with escharotics, actual or potential. They may be often employed when pressure ought not; styptics promote the contraction and retraction of the divided extremities, and thereby expedite the formation of a coagulum. Escharotics form a slough, which, adhering to the extremity of the vessel, stops the flow of blood, and the cut margins of the vessel, being stimulated by the application, soon cohere. Active stimulating applications merely cause effusion quickly of coagulated lymph, and thus often arrest hemorrhage from very vascular surfaces better than the so-called styptics. Not unfrequently, after the separation of the slough, it is found that union has not taken place, and hemorrhage is renewed; from this circumstance, the remedy cannot be trusted to, except when the divided vessels or vessel are of small size. It may be stated, generally, that these means are of little avail without methodical pressure. In oozing from small vessels, pressure may be applied by means of agaric, sponge, or lint. In bleeding from small vessels, where there is general oozing from the surface, and pressure cannot readily be made, applications tending to produce effusion of lymph — stimulants, such as turpentine or creosote, are often remarkably efficacious, and very speedily so; but in wounds of the larger vessels, the most efficient mean is a graduated compress of lint placed immediately on the external wound, and supported by a firmly-applied bandage. The bandage ought to encircle not only the wounded part, but every part of the limb with a uniform tightness, not so great as to arrest the general circulation; the parts are thereby supported, and engorgement prevented. This method, when employed previously to the effusion of much blood into the cellular tissue, has proved effectual in wounds even of the brachial, femoral, and carotid arteries. When blood has been extensively injected into the limb, when the aperture in the vessel has remained pervious, and when a large diffused aneurism exists, bandaging is worse than useless. By its application in such a case the limb becomes discoloured and swells extensively; there is a risk of mortification from impeded circulation. If a small quantity only of blood has escaped, its diffusion and increase may be prevented by the bandage: but a cyst will nevertheless be formed in the cellular tissue; its parietes will communicate with the margins of the aperture in the artery, its cavity with the canal of the vessel; an aneurism of the false kind will be established, and will run the course of one arising spontaneously.

A ligature, well applied, is the only means that can be relied on. The immediate effect of a tightly-drawn ligature is to avert the flow of blood, to divide the internal and middle coats at the deligated point, the cellular coat remaining entire, and to narrow the canal for some extent above the point at which it is applied. Coagulation then occurs within the vessel above the ligature, provided there is no collateral branch in the immediate vicinity. The ruptured margins of the internal coat effuse lymph and cohere; lymph is effused also in the cellular tissue, exterior to the artery and to the ligature; by the compression of the ligature, ulceration occurs in those parts which it envelopes, and the foreign body is discharged; but before this occurs the canal of the vessel has been obliterated by an internal coagulum, and by the effused lymph. Afterwards, the same absorption and consolidation occur as in a divided artery, the orifice of which has closed permanently and spontaneously.

When from a punctured wound profuse hemorrhage ensues, there is reason to suspect that an important vessel has been hurt, and the bleeding point must be sought for. After the artery giving out the blood has been discovered, the external wound must be enlarged, so as to expose the vessel, and admit of the convenient application of a ligature. It will not be sufficient to include the vessel above the wounded point, for the lower part will, after some time, be supplied with blood by the collateral branches almost as freely as by the large trunk, and, consequently, bleeding will be renewed. Two ligatures are to be employed, one above, the other below, the wound. The wounded vessel must be exposed, as already stated, but not detached more than is sufficient for the application of the ligature; and at the same time the ligatures ought to enclose nothing but the vessel. Neither ought the ligatures to be placed at any considerable distance, but as close to the wounded point as possible; otherwise circulation in the included part may be restored. The ligature, round, narrow, and firm, ought to be tightly applied. Cases of hemorrhage have occurred in which the tying of the vessel immediately above the wound has been successful; but these are few, and by no means afford any authority for the general adoption of such a measure. If the vessel is merely punctured, it is necessary to apply the ligature by means of a blunt pointed needle, and the parts are to be disturbed as little as possible. If, however, the artery is completely divided, its cut extremities are to be drawn out of their sheath by a hook or forceps, and the ligatures applied close to the connections of the vessel; the vasa vasorum, in the immediate vicinity of the deligated point, being left to carry on those processes by which obliteration is accomplished. In punctured or partial wounds of arteries, it deserves consideration whether the hemorrhage may not be restrained by the application of slight pressure, so regulated as to prevent the flow of blood laterally through the wound, but not so forcibly applied as to stop the onward current of the blood along the vessel, from the part of the tube above to that below the puncture. Some experiments made by Dr. Davy seem favourable to this view; as bleeding from the carotid arteries, partially divided transversely, in dogs was easily arrested by the means above-mentioned, the wound of the vessel readily healing, so as to preserve its tube entire; whereas, when the pressure was increased, the hemorrhage became violent. The subject is mentioned as one worthy of a further experimental investigation. The instrument which will generally be found most useful for laying hold of the vessel is the common dissecting forceps, but a tenaculum will, in certain circumstances, be more convenient. By far the most convenient machine is that here represented.



When no assistant is at hand, and in cases of emergency, the surgeon provided with this little instrument can tie vessels without the least difficulty; and in operation, when many vessels spring, several of these forceps can be applied; there is besides this great advantage in their employment, that a clumsy assistant can scarcely include the point of the instrument with the vessel. Hemorrhage from the smaller vessels soon ceases; and, before reaction occurs, their orifices have generally become so obstructed as to resist the effusion of blood.

The effects of ligature on a vein are somewhat different from those on an artery. The inner coat of the former is more dense and elastic, and remains entire, whilst the external and middle are divided. It is puckered by the ligature, and its opposite surfaces are placed in immediate contact; but there is no breach of surface, and adhesion does not occur till the tunic has been divided by ulceration; then the opposite margins cohere, the vessel is obliterated, and undergoes changes resembling those in an artery similarly circumstanced. The coagulum between the ligature and extremity is of considerable extent, dense, and completely filling the canal of the vein, and consequently, of a cylindrical form.

The edges of the wound, in the soft parts, ought not to be approximated till the bleeding has entirely ceased, and the surface become glazed, for the interposition of the slightest quantity of blood prevents union by the first intention. When bleeding has ceased, the divided edges are to be brought together as accurately as possible, and adhesion promoted. The minute vessels assume an action greater than in the healthy state, though not equal to inflammatory action; they effuse coagulating lymph, by which the opposed surfaces are agglutinated, though the union is at first feeble and easily broken up. Soon the lymph is firmly attached, by newly-formed vessels, to the surface from which it was secreted; in effect, it becomes organised, and rendered capable of undergoing, through its inherent powers, the changes necessary for its perfection and stability. Similar processes go on in it as in any sound part of the body; new matter is deposited, and the superfluous is absorbed. The process of nutrition, however, is not the same in all parts of its substance, that is, the new matter deposited is not exactly similar at all points; but, according as the new secreting vessels proceed from the different tissues of which the margins of the recent wound are composed, so, in various parts of the new formation, these vessels assume peculiar modes of action, one set forming muscular, another cellular tissue, and a third a substitute for skin, formations corresponding to the primary tissues from which the secreting vessels proceed.

Thus the vasa vasorum, ramifying on the divided ends of the minute vessels, secrete a substance which is transformed into a set of minute capillaries, and these also, assuming a secretive action, produce an arterial or venous tube, similar to that nourished by the original vasa vasorum. By this process the lymph becomes well supplied with bloodvessels, those from the opposite surfaces meeting, and freely inosculating with each other. These bloodvessels, as already stated, have been produced from arteries possessing different powers, and hence the newly-formed assume actions similar to those of the primary, and thereby interstitial matter is deposited of its proper kind and in its proper place, a cuticular membrane superficially, then cellular tissue, afterwards muscular, and so on according to the primary tissues which had been divided; these parts do not at first resemble exactly the corresponding natural tissues, but, by the continued action of the new vessels and capillaries, they are moulded and prepared for the due performance of their respective functions. If the degree of action necessary for the accomplishment of these processes increase to inflammation, adhesion is interrupted till the action be lowered to its previous standard.

From this view it is evident, that, besides a certain excitement of the bloodvessels, it is necessary that the raw margins be in close apposition, and carefully retained so, for, by ever so slight movement of the parts, the recent and delicate bond of union will be ruptured; and, if this motion be allowed to continue, adhesion may be at divers times begun, but can never be perfected. Whereas, if the necessary precautions are adopted, union is often completed in thirty or forty hours, sometimes sooner, seldom later. From a knowledge of the astonishing powers of nature in repairing injuries, many and important improvements have of late years been made in the practice of surgery. In the majority of instances it is also requisite that the parts be brought in contact soon after division, otherwise granulation will have commenced in the different parts of the wound, and the surfaces then approximated will not so readily adhere: pus is formed, and, having lodged between the surfaces, acts as an extraneous substance, keeping them apart, and separating them still farther by its accumulation. All foreign bodies in the wound must be removed before adhesion can occur; and, on the same principle, care ought to be taken that no effused blood be interposed. In many cases the margins of the wound can be accurately adjusted by careful attention to the position of the part, or by the application of a few strips of adhesive plaster; but the latter, from indiscriminate use, often prove the source of much irritation, and totally frustrate the end for which they are designed. When employed, they ought to be narrow and few. If such means be considered insufficient, recourse must be had to a few points of interrupted suture, and these are not productive of bad consequences which have been by some attributed to them. When neatly applied, they can produce but little irritation, more especially if removed as soon as their presence is unnecessary, that is, as soon as adhesion has fairly commenced, and the natural bond of union is of such strength as to need no artificial assistance. By these the edges of the wound are more neatly and suitably placed than by any other means; they meet easily, without the puckering or overlapping of each other; and, from the circumstance of sutures obtaining a more just coaptation, they can be sooner discontinued. In most wounds no other dressing is required; but in some a combination of sutures, adhesive plaster, and compress, is necessary.

Of late, I have greatly dispensed with stitches and the common adhesive plaster, using, instead of the latter, slips of glazed riband smeared with a saturated solution of isinglass in brandy, which is much less irritating and more tenacious than the common adhesive compost. The parts are fixed temporarily with a single stitch, or two at most, and cloths dipped in cold water are placed over the wound; the ribands are not applied till the adhesive substance has partly congealed, and the oozing of blood ceased. The divided margins being approximated by the fingers of an assistant, the ribands are laid gently over, and held for a few seconds. Soon after a sufficient number have been applied the stitches are withdrawn, being no longer necessary. No other dressing is required unless suppuration occur; the ribands will adhere firmly till the completion of the cure, and thus the pain and irritation caused by frequent dressing is avoided. Even the largest wounds, as after amputation, are treated in this manner with the most satisfactory results. Of late years a plaster, made by coating oiled silk with a solution of isinglass, has been used instead; the glazed surface of the slips is moistened, and applied as here directed.

If at any part adhesion fail, suppuration and granulation must follow. The adhesion may be prevented by any of the circumstances already mentioned, or by an unfavourable state of the constitution, the nature of the wound, exposure to bad air, the occurrence of fever, or of a flux natural or not. The wound may contain foreign matter, blood or the contents of canals may be effused into it, and many other obstacles may exist to retard, or prevent adhesion. Notwithstanding, in all cases, though the chance of union be but small, the parts should be approximated. A great point is gained if certain parts only are brought to adhere, for by their natural attachments the opposite surfaces are preserved in more direct contact than they could otherwise be, and thereby but little space remains to be filled up with granulations. If, on the contrary, the surfaces are not approximated, the flap is diminished in size, and when afterwards placed in contact with the surface from which it was detached, it is found not to correspond, leaving considerable deficiency to be repaired by the comparatively slow process of granulation. Whereas, if it had been early replaced, partial attachments would probably have been formed by adhesion, the flap thereby retained in situ, and prevented from shrinking, so that but little new matter would be required.

Sometimes union does occur, and that speedily, after the flap has remained separate for a considerable time; and in such cases it may be doubted, whether union is accomplished by adhesion, strictly so called. Most probably it is by this process that the rapid union occurs in such circumstances: the divided parts have assumed an excited action, and effused lymph; during their state of separation, the lymph will become organised when it is connected with the original parts, just as well as if the surfaces had been in contact; and when they are at length so placed, they will be agglutinated to each other by the outer part of the effused lymph, which still continues soft and unorganised. If motion be then prevented, organisation, which has already commenced in the connecting medium, will proceed undisturbed, converting the agglutination of soft unorganised lymph into firm and permanent union by means of organised tissue. In these circumstances, it is not to be wondered at if adhesion should be completed in a shorter time than when the surfaces are brought together immediately after their division; in each instance the process is the same, only in the one it has to proceed from its very commencement, whilst in the other it is previously all but perfected, and after the parts have been put together, the last stage only requires completion. It is only in a particular stage of a granulating surface, that adhesion will take place speedily, when the discharge is diminished, but healthy, and the granulations florid and firm.

When a wound is to heal by granulation, the exposed surface at first is dry, painful, and slightly swelled, and afterwards a thin discharge of bloody serum is poured out, with relief to the painful sensations; the surface is at this time covered by a thin layer of coagulated lymph, and the parts, if approximated, are in the most favourable state for adhesion. Soon, however, the vessels assume a different mode of action, and secrete a fluid which becomes purulent; the effused lymph has been organised, forms a living part of the surface from which it was deposited, and is covered and protected, in its yet delicate condition, by the purulent fluid. This new matter is disposed in numerous small conical projections of a florid colour; and these, by their own power, from others similar to themselves, at the same time discharging purulent matter; so that, in a healthy constitution, the cavity is soon filled by the granulations, which come to the same level as the surrounding integument. Sometimes they are exuberant, soft, and spongy, and in this state possessed of little sensibility, and but ill supplied with bloodvessels. At others, they are slow in approaching the surface, and then often morbidly sensible. In all cases, the new matter is very apt to be absorbed, either from the state of the patient's health, or from the nature of the applications; and foreign substances, in a state of solution or minute division, are more readily taken into the system from the raw surface than from the sound skin. When, then, the granulations approach the skin, the sore contracts, the newly formed parts being modelled into a more firm and dense condition by the action of the absorbents. Sometimes, in superficial sores, the skin is seen spreading from several parts near the centre; but at these points portions of the original skin must have remained uninjured, though the others were destroyed, and have formed cutaneous matter as soon as they were on the same level with the surrounding granulations; for these insulated portions of skin are not a product of granulations, as some suppose, but of a substance similar to themselves. Skin is formed from skin. Thus, where a part of the integuments has been completely removed by operation, or destroyed by accident, no islands of skin are observed during the cure, but the sore is uniformly covered by skin proceeding from its margins. The margins of a healing sore are of a white colour, and adherent to the subjacent parts; but in an unhealthy one the margins are often unsupported, the subjacent granulations are absorbed, and their place is occupied by thin purulent matter; the new skin is unable to maintain its independent existence, continues of a dark colour, perhaps for a long period, then wastes away or sloughs. The recent cutaneous matter covering a sore contracts, and the neighbouring old skin is extended; the new surface is thus diminished; it assumes a slightly puckered appearance, and is termed cicatrix. This is at first pretty vascular, the vessels running straight; after a time they contract and become invisible, and scarcely admit fine injections. Frequently the scar is so far absorbed after some time, as to leave only a firm line, whiter and more dense than the surrounding integument.

If union by the first intention does not take place, then all the application to procure it must be abandoned, all sutures, plasters, compresses, &c., must be dismissed, for they now can do no good, and may be productive of harm; the attention, on the contrary, must be directed to effecting union by granulation; with this view, other means are to be chosen, so that to continue those which were formerly used to promote adhesion would be absurd, when adhesion can no longer be expected. The stitches must then be taken out, when inflammation has gone off, and œdema remains, the parts are to be supported; and by attention to position, and gentle bandaging, the size of the wound will be diminished. Inflammation must be subdued by the usual means, and suppuration encouraged by fomentation and poulticing, or warm water dressing. After inflammation has subsided, tension disappeared, purulent discharge occurred, and granulations formed, the edges of the wound are to be gently brought together, so as to render the quantity of new matter requisite for filling up the cavity as small as possible. Nature will then accomplish the union in her own way, and we can only assist and minister to her; for who thinks now of healing wounds by pure force of surgery? The dressings ought to be light, the ointment, if any is used, scanty; in some cases the application may be dry; but in many cases various lotions will be found of much advantage. These latter are used of different qualities, according to the nature of the sore; and these can be of little avail unless evaporation be prevented, by a piece of oil-silk laid on the outer surface of the dressing. In most granulating wounds, they require to be of a mildly stimulating nature, and the one which I have most frequently employed is a weak solution of the sulphate of zinc. The integuments round the wound may be occasionally washed, to prevent excoriation, but no good can accrue from washing the sore; its natural discharge is its best protection, and if superabundant, it can be removed by means of dry lint or tow from the surrounding parts.

From bruised and lacerated wounds there is little or no hemorrhage, but in proportion to the severity of the bruise, is the bleeding slight, and the danger great. The bloodvessels are so torn and twisted as to permit the spontaneous and temporary suppression of hemorrhage to occur almost immediately; and the larger arteries may escape entirely, owing to their elasticity. Sometimes after bruised wounds, such as those inflicted by gunshot, the large vessels bleed instantly and violently; often, however, hemorrhage occurs only after the sloughs separate, many days after the infliction of the injury, and then it is generally very profuse; in some instances, limbs are torn, bruised, or shot away, without hemorrhage occurring to any great degree, or at any period. Frequently the vitality of the parts surrounding the wound is much diminished; and the whole limb is apt to become gangrenous, either immediately, on account of the extreme violence of the injury, or consecutively, from greatly excited action going on in parts whose power of resistance has been much impaired: it often arises also from constitutional peculiarity. The gangrene extends often rapidly, in consequence of the infiltration of putrid serosity into the cellular tissue. In the treatment of bruised wounds, the position of the parts must be carefully attended to; they must be placed in a state of relaxation. In general, it is unnecessary to retain the margins of the wound in contact, for adhesion cannot occur — suppuration must ensue, and is to be desired — and the dead and dying parts must be loosened and discharged before union can take place. Sometimes, as when a large flap has been detached, and the parts not much injured otherwise, approximation ought to be accomplished, for the reasons already mentioned. In almost all cases, and most certainly in those in which the mechanical injury has been severe, and its effects extensive, violent inflammatory action is to be dreaded, and measures must be taken to ward it off: notwithstanding the prophylactic treatment, violent inflammation often comes on, and then recourse must be had to the means proper for the subduing of it. Blood is to be taken from the part, if necessary, and soothing applications used, in the form of fomentation and poultice. The main indications are to prevent extravasation into the substance of the limb, and strongly excited action. When the sloughs begin to separate, emollient poultices promote the suppuration and discharge of dead matter, and afterwards the sore must be dressed, according to the nature of the case, with the applications most fit for granulating sores in their different degrees of action and advancement. During the after treatment, the sides of the sore ought to be well supported, so as to prevent, as much as possible, suppuration from extending along the neighbouring cellular tissue; but, at the same time, the dressing must not be so tightly applied as to cause irritation. When abscesses have formed in the neighbourhood, the cavities should be freely exposed by incision; thus a free discharge will be given to the matter, and the cavity brought to granulate from the bottom. During the suppurating stage, the patient's strength must be maintained by generous diet.

Punctured wounds are dangerous, from the deep and internal effusion of blood and serum which usually attends them. The effusion, which in open wounds is poured out externally, and moderates and prevents the excited action from exceeding what is salutary, is, in punctured wounds, poured into the substance of the limb to its detriment. It is followed by severe inflammatory action and profuse suppuration. In order to prevent these untoward results, it was formerly the practice immediately to dilate the wound; but this is hurtful, for if the wound be deep, as it generally is, dilatation of its whole extent is a proceeding severe in itself, and in its consequences; whilst, if the external part only of the wound is dilated, the operation will entirely fail to effect what is intended. The knife will be used in great good time where a foreign body is found to be lodged in the wound, when tension has occurred, or matter has formed. Sometimes the wound heals throughout its whole track by adhesion, without any bad symptoms being so much as threatened. Setons, recommended in this class of wounds, are of no service. It is not the narrowness of the external opening, as is sometimes supposed, that is the cause of all the mischief, but the injury and consequent inflammation of deep-seated parts.

Poisoned wounds are rare in this country. Wounds by the stings of certain trifling insects produce considerable swelling in some constitutions, and when the injury has been inflicted on a loose texture. In some parts of this country, the bite of a small adder causes pain, swelling, and unhealthy suppuration of the part, with some constitutional disturbance, but the results are seldom serious, and never fatal. In warmer climates, the bites of some snakes are followed by the most violent symptoms; in some cases proving fatal in a few hours, in others after a day or two. Great swelling occurs almost immediately, attended with excruciating pain, and extends upward along the limb; vision becomes impaired, the patient lies in a state of stupor, and ultimately succumbs under convulsions and delirium; the symptoms vary in particular instances according to idiosyncrasies and the state of the constitution when the injury is inflicted.* In this country, the bites of rabid animals are more dangerous than those of animals naturally poisonous. Rabies most frequently occur in dogs, and others of that species, such as wolves, foxes, &c. They become dull, sluggish, and irritable; have unnatural appetites and cravings, devouring their excrement and urine; the stomach is generally found full of chopped straw, pieces of wood, &c. Derangement of the cerebral functions is not complete, — they know and obey their master. They are often not afraid of water, but lap it and go into it readily. From them the disease is communicated to the human subject, and to the lower animals, such as cats, sheep, cattle, and even fowls; the virus is not communicable, except by the deposition of the saliva on an abraded surface, or into a wound. It is not produced by eating the flesh of a rabid animal. During the first days of the attack, pustules are, it is said, observed under the tongue, but there is no apparent change in the glands. The symptoms of hydrophobia in man seldom appear before the twentieth day after the infliction of the wound, and in some instances they have not presented themselves till after the lapse of months. The most prominent are great restlessness, much irritability and anxiety, and convulsions of the muscles concerned in deglutition, produced either by attempts to swallow, or by fluid being presented to the patient. Ultimately, the spasms become general, are induced by the most trifling exertions or noises, and prove fatal in a few days. Frequently the patient retains his senses throughout, and is fully aware of his lamentable situation; in other instances, he soon becomes delirious, raves, and threatens his attendants. For this horrible disease we are unacquainted with any cure. In general, profuse bleedings are employed, and large quantities of opium given internally; every powerful antispasmodic, as well as every violent medicine, has been made trial of, but in vain: some certainly mitigate the symptoms, but none cure the patient. It has been even proposed to suspend or destroy the function of the nervous system for a time, by the employment of the Wourali poison, keeping up at the same time respiration by artificial means, under the expectation that thus the impression on the system might be got over. The morbid appearances usually observed after death are marks of inflammation of the pharynx and air-passages, and of the mucous surface of the stomach and intestines. It is evident that the disease ought to be prevented if possible, and for its prevention the most efficient measure is timely excision of the affected parts; and they should be cut out a long period before the constitutional affection comes on: when excision is dangerous, or wholly impracticable, and when the patient does not apply soon after the accident, the injured parts may be destroyed by some active caustic, as the potassa fusa. The nitrate of silver has been strongly recommended and extensively employed by Mr. Youatt, whose experience in this disease is very great. This application should scarcely be trusted to alone. The removal of parts wounded by snakes, even after violent symptoms have appeared, has proved successful, ammonia having been at the same time administered internally. In some instances, arsenic has been found efficacious when given in large doses, and frequently repeated.*

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* [In this country we have a number of insects, the sting of which is sometimes attended with considerable pain and swelling, or even high inflammatory excitement. Of these, the most common are the bee, wasp, hornet, yellow-jacket, and humble-bee, which all secrete a subtle poison contained in a reservoir in the abdomen, from which it is projected by the barbed dart when in the act of stinging. Severe and even dangerous wounds are occasionally thus inflicted; indeed, in a few instances death has been known to follow, especially in persons of a nervous, irritable temperament. Another insect, from the bite of which a good deal of irritation often results, is the musketoe, which abounds everywhere, during the hot summer and autumnal months, along the water-courses of the western and southern states. The little punctures made by this animal I have known in several instances to degenerate into unhealthy sores, furnishing a thin, sanious discharge, attended with more or less itching, and exceedingly difficult to heal. The late Professor Dorsey mentions a case — that of a lady who previously enjoyed good health — in which the bite of the musketoe terminated in gangrene and death.

Of the great number of serpents inhabiting this country, only two — the rattlesnake and copperhead — are known to be venomous. Both are very active in warm weather, are furnished with long teeth, and secrete an acrid, virulent poison, of a yellow-greenish colour, which is lodged in a bag or reservoir at the roots of two of the teeth of the upper-jaw. When this poison is fairly infused into a wound of the skin and cellular tissue, it often proves fatal in a few minutes; in other cases, the patient either recovers, or death does not occur until a later period. — Ed.]

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* [The wounds made by the stings and bites of insects are best treated by stimulating lotions, such as salt-water, vinegar, alcohol, hartshorn, and camphorated spirits. These remedies generally afford prompt relief, and they possess the additional advantage of being always near at hand. Bleeding, purging, and opiates, may become necessary, when, besides much pain and swelling, there is a great degree of constitutional disturbance. When bees and wasps find their way, as they sometimes do, into the œsophagus, causing violent suffering and nervous agitation, almost instantaneous relief may be afforded by making the individual drink large draughts of vinegar or salt and water.

When a person has been bitten in one of his limbs by a venomous serpent, a ligature should be immediately applied, as tightly as possible, at a short distance above the wound, which is then to be care-

Wounds received during dissection occasionally have unpleasant consequences from the absorption of animal matter. The absorbents leading from the wounded part become swelled and painful, and in slight cases there are shivering and general indisposition for some days. The more violent symptoms arise from examining bodies which are rather recent, and in which putrefaction is just commencing, and very frequently from inspecting the bodies of females who have died of puerperal diseases. The absorption may take place from punctures made by scissors, the point of a knife, or spiculæ of bone, or from old scratches, or chops by the side of the nail or on the hand. There is little or no danger from an open and bleeding wound, as by the flow of blood the part is completely cleaned; it is generally from slight punctures that untoward symptoms need be apprehended. Effects similar to those resulting from wounds in dissection often occur in nurses and others who have pricked themselves with pins while washing foul clothes, or from handling poultices or dressings removed from bad, putrid, or sloughing surfaces. The symptoms already mentioned are soon followed by others more severe: shivering continues, and the patient is seized with vomiting; the part affected, and often the greater part of the arm, becomes red and much swollen; the cellular tissue is infiltrated with serum often dark and putrescent, abscesses form at various points along the limb to the axilla, and purulent matter is diffused throughout the unhealthy cellular tissue, which in many instances sloughs, and gives rise to extensive sores. Typhoid symptoms soon appear, and in the more aggravated cases speedily prove fatal. When such local and constitutional symptoms arise, it will generally be found that the patient was of a broken-up constitution previously to the infliction of the wound; did they solely depend on the inoculation of virus, they would be of very common occurrence, considering that wounds are so frequently received during dissection; but it is seldom comparatively that any unpleasant symptoms follow such an accident. In all cases, however, it is prudent to adopt measures in order to prevent absorption of the virus. With this view, the wound is made to bleed by means of pressure or suction, and by the latter method the exposed surface is most effectually purified; afterwards nitrate of silver may be applied to deaden the surface, and protect it by an eschar. If such means be unavailing, the after symptoms must be encountered as they appear, local inflammation subdued, tension re-

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fully excised together with a portion of the surrounding structures. A cupping-glass is next applied, and after this has remained on for several hours, the sore is to be dressed with an emollient poultice or some simple unguent, or fomented with cloths wrung out of warm water and laudanum. The only internal remedy upon which the slightest reliance is to be placed, is arsenic, in the form of Fowler's solution. It should be administered, as was first suggested by Mr. Ireland, an English surgeon, in doses of two drachms every thirty minutes until an ounce or upwards is taken, or until free vomiting and purging ensue. — Ed.]

lieved, abscesses opened, sloughs removed, &c. General bleeding is seldom admissible, but purgatives and antimonials will prove beneficial at the commencement; afterwards the strength is to be supported, and, if the patient be much reduced, stimulants are to be liberally administered.

We shall next treat briefly of gunshot wounds; under this head are included the contused and the lacerated, caused by splinters, &c. The vitality of the injured surface is generally destroyed at once, whence bleeding seldom occurs, even after whole limbs have been shot away; in some cases, however, hemorrhage is profuse, as when a large artery has been wounded by small shot. The effects on the system are extremely various; some persons are affected with tremors, anxiety, and depression from slight wounds; while the most severe injuries are often unaccompanied by any disturbance of the nerves. The shock is generally of short duration, disappearing soon, on the patient's being reassured and encouraged, or after his taking a little wine or opium. In gunshot wounds, those inflicted from a distance or close at hand can in general be readily distinguished. In the latter, the wound is large and lacerated, portions of the wadding are impacted, and the skin around is marked with grains of gunpowder. In the former, the wound is small and clean. When a ball passes through a fleshy part, the opening at its entrance is small and depressed; whilst that by which it escaped is open, with everted edges. When it follows a superficial course, its track is marked by a wheal, or elevation of the skin with discoloration. At one time, it was believed that the most serious consequences resulted from a ball passing close past the body without even touching it — that in this way violent concussion of the brain, proving instantly fatal, was produced; but this notion has been disproved by experience; part of the head accoutrements, of the hair, of the nose, and of the ears, have been shot away by cannon-balls, and yet no disturbance of the brain has followed either immediately or consecutively. The opinion originated from the circumstance of soldiers having been found dead without any evidence of injury; but bones are often broken and comminuted by an indirect blow, or by a spent ball, without any breach of surface or external sign remaining; internal injuries indeed — rupture of viscera — more than sufficient to cause instant death, are thus inflicted without any apparent external læsion.

The course of a ball in the body is often very strange, depending on the force with which it is projected, or the resistance which is opposed to it, and on the position of the struck part. Balls often pass under the integument almost completely round the head or chest, having first struck the bone at a very oblique angle. Frequently they remain, lodged along with part of the clothing which they thrust before them. In such cases, they may be immediately removed, their exact situation being previously ascertained by external examination, or by means of a probe. They can generally be extracted through the aperture by which they entered; but if situated superficially, and at a distance from the opening, this will be more readily accomplished through an incision made upon them; if allowed to remain, suppuration will occur in the neighbourhood, the surrounding cellular tissue will be condensed, an abscess will be formed containing the foreign body, and by the process of absorption proceeding in the parts external to the abscess, the ball will at last reach the surface, and be discharged. The track is often so extremely tortuous, as to render it impossible to ascertain the situation, or even the existence of the foreign body, which greatly impedes the operation; and, in other instances, it may be necessary to allow the ball to remain undisturbed, on account of its being placed near important parts, which might be injured by any attempt at removal. Foreign bodies often remain lodged in fleshy or membranous parts for years, having become enveloped in a dense cyst, and having ceased to produce any great irritation. In consequence of the force with which they have been projected, and the resistance which has been opposed to their progress in the body, musket-balls, when extracted, either immediately after the infliction of the injury, or after a considerable time has elapsed, are seldom found to retain their globular form, but are flattened and ragged, and not unfrequently completely divided by the bones on which they have impinged. A bullet may be divided into numerous fragments on a bone, and part may enter into the osseous substance, whilst other portions penetrate in all directions into the soft parts, and, though sharp and irregular, may remain long in the dense cellular cyst which forms over them, without producing pain or inconvenience. There will necessarily be suppuration, and generally discharge of dead matter, from gunshot wounds, in consequence of the bruising of the parts by the ball, which may be expected to injure the superficial layer of parts in its tract so severely, that it must slough more or less.

Besides, the bones are often splintered by the force with which they are struck, and loose portions of them lodge amongst the muscles; then they are the cause of much mischief, for, on account of their long, sharp, and irregular form, they occasion great irritation, suppuration ensues in various parts, sinuses form, and the cure is rendered very tedious. In other cases, the bone is split in a longitudinal direction, and, in the cylindrical bones, these fissures are often of great extent.

Considering the nature of the body which inflicts the injury in a gunshot wound, and the velocity with which it is impelled, it is evident that the cure must be in all cases tedious, in consequence of the sloughing and suppuration which is induced, particularly at the aperture through which the ball passed. The foreign body ought always to be removed as early as possible, provided it can be accomplished without much violence, or injury to the parts. Dilatation of gunshot wounds is now had recourse to only to facilitate the removal of balls, splinters, &c., and even with this view, it ought to be employed but to a very slight extent, if at all; for foreign substances, when deeply seated, can be much more easily taken out when the sloughs are separating, and the parts relaxed by suppuration; then, too, they can be more readily reached through a counter-opening, when their situation renders this expedient. In short, the surgeon is not justified in cutting for balls, unless they are easily felt, and not deeply lodged. In order to discover the foreign body, probes will sometimes be required; the finger often answers the purpose best, unless when the wound is of considerable depth. If, on examination, the ball cannot be discovered, and if there is reason to think that it has followed an indirect course, the surgeon will, sometimes, be assisted in his search by placing the patient in that position in which he received the wound, and then judging of the circumstances most likely to affect the foreign body in its passage. In many cases, extraction can be accomplished by means of the finger alone; in others, forceps and scoops, various in length and size, are indispensable. Afterwards, light dressings are to be employed; and in the first instance, cold applications may prove advantageous in keeping down the inflammatory action; but when inflammation has commenced, and to encourage suppuration, warm fomentations and poultices are to be preferred; they will in many cases be both more grateful to the patient and more beneficial in their results, when used even from the commencement. Afterwards, it will be necessary to afford sufficient support to the parts by bandaging, and to change the applications according to the particular circumstances: — soothing, if the wound be irritable, stimulating, if inert, and gently escharotic, if the granulations be exuberant.

In severe injuries of the limbs, the surgeon must be guided by the state of the part, and of the constitution, by the circumstances in which he is placed, as to accommodation, and mode of transportation, &c., in deciding on the removal of the part by amputation, — or on making an attempt to save it, by trusting to, and assisting, the processes of nature. The question whether to amputate immediately, and on the spot, merely allowing the shock, if any exist, to pass away, or to delay till suppuration occur, is now scarcely a matter of dispute. When it is evident, from the extent, violence, and nature of the injury, that there is danger of speedy mortification, or of extensive and severe inflammation and suppuration, amputation is to be instantly performed, — delay is inadmissible. In comminution of the hard, with contusion and laceration of the soft parts — where limbs have been shattered and completely detached, or nearly so — in lacerations of parts, including the principal bloodvessels and nerves — fractures of the heads of bones, with openings into the joints — and in bad compound fractures, more especially of the thigh (for all compound fractures of the upper part of the thigh are dangerous), amputate at once. When the limb has been retained, and gangrene arises in consequence of the external injury, and when there is no reason to suppose that any internal cause is also in existence; or when the violence of inflammatory action has subsided, and the patient is become hectic, with profuse purulent discharge, and with disunited bones, then amputate. But, in this latter case, the chance of recovery is not so great, and the proportion of recoveries small; whereas, in the immediate or primary operations, the very reverse holds true. Such is the experience of the greater number of military surgeons. In civil practice, the results are somewhat different; a greater proportion of primary amputations are unsuccessful, and the secondary turn out more favourably than the statements of military surgeons would lead one to believe. In all cases, the judgment of the surgeon must guide him in his determination. The circumstances of the case, and the probable contingencies, must be all duly considered, and he must not proceed with his knife where there exists even a slight chance of preserving the limb.

Paralysis occasionally follows wounds of the arm, fore-arm, face, &c., inflicted by accident or operation, and this arises from an important nerve, or set of nerves, being divided. In cases of simple division, without much separation of the parts, reunion of the nerves may take place, and their functions be restored. If the limb remains paralysed, after cicatrisation of the wound, tepid effusions, friction, dry or with liniment, stimulating applications, &c., may sometimes be advantageously employed.

TETANUS

Is a disease which occasionally follows a wound, but rarely in this country. It is a spasmodic contraction, with rigidity, of the voluntary muscles, in some cases involving the whole body, in others the upper part of it only, and in some it is confined to a certain class of muscles. When the extensors are affected, the disease is termed opisthotonos; when the flexors, emprosthotonos. Complete tetanus is said to exist when the flexor and extensor muscles exactly balance each other, and the body is thereby kept straight and rigid. But when the affection is confined to the muscles of deglutition, and chiefly to those moving the lower jaw, it is called trismus. The disease has besides been divided into acute and chronic, and into traumatic and idiopathic; the one following wounds, the other arising from internal causes, or circumstances not connected with the læsion of the surface. The disease supervenes at various periods; sometimes, though rarely, not long after the infliction of the injury, in other instances after the lapse of eight or ten days, and often when the wound is healing, or nearly cicatrized. In warm climates, where it is of very frequent occurrence, it occasionally seems to be caused by exposure to damp and changeable weather; in children, it supervenes on the slightest irritation. It is often induced by the presence of splinters, or rather bodies of an irritating nature, and by the partial division of nerves. Not unfrequently it occurs after clean wounds, as amputation or venesection; in the former it may perhaps arise from a nerve being included in the same ligature with an artery, in the latter, from a nervous twig being partially divided. The more prominent symptoms are, stiffness of the back of the neck, and contraction of the features; difficult deglutition supervenes, and the efforts to accomplish it are attended with violent spasms of the muscles of the pharynx and œsophagus. Spasms of the injured limb often precede those of the muscular system generally; the muscles of the lower jaw become rigid and spasmodically contracted, and by a continuance and increase of the spasmodic action, the mouth is at last completely and immovably shut. The muscles of the trunk and limbs become affected, and there are violent spasms of particular sets of them, most generally of those situated posteriorly; thus the body is bent violently backward, so that its whole weight is supported on two points only, the heels and the occiput. These symptoms are not constant; relaxation occurs, and the patient enjoys a cessation of the malady: but this is only temporary; the painful feelings and the spasms soon return. A symptom of the most distressing nature is pain and spasmodic twitching of the diaphragm, impeding respiration, and imparting a shock to the whole system. Occasionally, emprosthotonos occurs, but, so far as my experience goes, the body is much more frequently bent backward; the muscles are sometimes ruptured by the violence of their own action. The circulating system and sensorial functions are often not much disturbed; but during the whole course of the disease, the bowels are much constipated. In most cases of traumatic tetanus, after four or five days, all the symptoms become aggravated; the countenance is horribly distorted, the spasms of the diaphragm are more frequent and violent, and the patient dies convulsed. Sometimes, though rarely, the fatal termination does not take place till the eighteenth or twentieth day. On dissection, the pharynx is found contracted, and bearing marks of acute inflammation. In one case, which fell under my observation, there was ultimately great difficulty in breathing and expectorating; and on examination, the trachea, as well as the pharynx, bore evident marks of inflammation, and were filled with a viscid mucus. In some instances, there are evident marks of inflammation of the spinal chord; the vessels, more especially at the lower part, are found enlarged, tortuous, and engorged with blood; portions of lymph are seen deposited on the arachnoid covering, and a serous fluid is effused, not unfrequently mixed with blood. Such appearances, however, are not observed in every case of fatal tetanus, and therefore it cannot be asserted as a fact, that the disease is dependent on a morbid condition of the spinal chord, though in certain cases the two affections coexist. By some it has been supposed, that in consequence of the distended and engorged state of the spinal arteries, the origins of the nerves are stimulated, and that a morbid affection of them ensues, giving rise to the tetanic symptoms; but want of uniformity in the morbid appearances prevents such a cause from being generally set down as the origin of tetanus.

This disease is one of the most intractable with which the surgeon has to contend. In the acute form, time is scarcely allowed for remedies; and in the advanced stage, it is with much difficulty that medicine can be received internally. Of course all irritations must be removed, both local and general, as far as that can be accomplished. If the patient be robust, and if the tetanic symptoms be ushered in with arterial incitement, general depletion ought certainly to be practised; and if the symptoms be such as to render the propriety of general bleeding dubious, blood may be abstracted locally, from the back of the head, or along the spine; and this may be followed by such counter-irritants as act rapidly. At the same time, powerful purgatives must be given, so as to bring the bowels into a better state; for, as already observed, obstinate constipation is a constant attendant on this disease. But the most important indication is to alleviate and prevent, if possible, the spasms; and for this purpose, opium is to be administered in large doses, either by itself, or combined with camphor or other antispasmodics. By such means, the disease has in some cases been arrested, but in the majority it has proceeded unabated. Some practitioners recommend and employ cold affusion and immersion, whilst others prefer the warm bath; and the latter appears to be the safer application, though neither can be considered as efficacious. Great relief and benefit seem to have accrued from the frequently repeated use of a warm bath, with some drachms of the tart. antimonii dissolved in it. I have had only two opportunities of trying this practice; one a chronic case, where, after the division of the nerves proceeding from the wound, this remedy, with others, seemed to allay the spasms in a very remarkable manner: the patient recovered. In the other, a very acute case, after the extraction of a splinter from betwixt the thumb and forefinger, the bath was tried; the patient felt much comforted by it; but suddenly expired in a violent convulsion, whilst being replaced in bed. Great relaxation follows this remedy, profuse perspiration, and subsidence of the rigidity and convulsive action of the muscles. The practice was recommended to my notice by my excellent friend Dr. Stevens, Professor of Surgery at New York. In some cases, it would be worth trial to produce instant vesication by the acetic solution of cantharides or ammonia, and then try the effect of the application to the blistered surface of some of the alkaloids, such as morphia, aconitine, &c., or belladonna might be applied.

Some practitioners have used mercurial frictions along the spine, or on other parts of the surface; while others administer stimulants, and enemata with tobacco and turpentine. When there is reason to apprehend that the symptoms arise in consequence of laceration or partial division of a nervous trunk, it has been recommended to complete the division of it; and the practice is worthy of adoption, as in some cases it appears to have been successful. Little good can result from scarification of the wound. Amputation of the wounded member has also been proposed, particularly in chronic cases, and in one or two it has succeeded. I have made trial of it in but one instance, and in that it failed. Acute tetanus had followed a lacerated wound betwixt the thumb and forefinger; amputation of the fore-arm was performed, and immediately after the operation the spasms abated; but they soon returned, notwithstanding the free use of opium, and other remedies, and the patient died. In this case, the branch of the median nerve was found partially divided, and its cut extremities were thickened and inflamed. During the operation, I wished to abstract a considerable quantity of blood, but the arteries seemed to be so spasmodically contracted, as to permit the flow of a small quantity only. On examination after death, the median nerve was of its natural appearance, excepting at the bend of the arm, where it was of a bright-red colour. No change could be perceived in the brain or spinal chord, though the examination was conducted with the utmost care.

OF ULCERS.

By ulcer is generally understood a breach of continuity in the soft parts of the body, with secretion of purulent or other fluid. But as suppuration may be independent of ulceration, so may we occasionally see a loss of substance like an ulcer on the surface of parts, without the production of pus, or any other morbid secretion, of which some instances are noted in the remarks on Atrophy of Articular Cartilage. Mr. Burns, in his excellent volume on the Principles of Surgery, has extended the term to the reparative process, as well as the destructive; this, if adopted, would lead to confusion and misapprehension.

Ulcers vary much in disposition and appearance, follow wounds, abscesses, sloughing, eruptions, &c., and often occur without any previous læsion of the surface. Those most generally met with are comprehended in the following classes:—1. The simple purulent ulcer, or healthy or healing sore. 2. The weak or sluggish ulcer,—a sore with undermined integuments and an unhealthy state of the cellular tissue. 3. The indolent ulcer,—a sore with hard elevated edges, and presenting little or no appearance of reparation. 4. The irritable ulcer,—a sore with over-action, and generally affecting only the mere surface of the true skin. Besides these, there are sores connected with diseases of the bones, and others arising from specific action; some are complicated with a varicose state of the veins: the former have been already treated of; the latter are reserved for consideration. Ulcers change their characters, as from simple to irritable, and from indolent to inflamed; the change depends on situation, on the state of the constitution, and on the treatment which they receive.

I. The appearances of the first class were described when the healing of wounds by granulations was considered, p. 173. They heal more readily on the upper extremities, on the face, neck, and trunk, than on the lower limbs; for in the former parts the circulation is more vigorous, the natural processes of cure proceed more easily, and are less liable to interruption. The sore only requires rest, a clean condition of the surrounding parts, mild and light dressings, and moderate support; dry lint or lotions are preferable to ointments, since the latter are apt to irritate by their rancidity. When the sore is of considerable size, and there is a tendency in the granulations to rise above the level of the surrounding skin or cicatrix, the edges may be protected by very narrow slips of fine old linen or cambric, spread with fresh spermaceti ointment or cold cream; a pledget of dry lint is then laid on, and retained by a roller. The dressings thus arranged do not adhere, and the tender cicatrix is not ruffled and disturbed; or a piece of pierced linen spread thinly with unirritating ointment may be placed over the sore, and above that dry lint. When the sore has contracted to a small size, and some powder, as starch or calamine stone, or a piece of dry lint, may be applied, so as to allow a scab to form for the protection of the subjacent surface; but this will, in most cases, be better accomplished by touching the surface lightly with lunar caustic or blue stone; the fluids on the part are thereby immediately coagulated, a crust is quickly formed, and by covering it with charpie, it is retained in its situation, whilst the process of cicatrisation proceeds beneath it: if a small quantity of matter should be secreted, it readily escapes by the sides of the crust, without disturbing either it or its covering; the limb should be raised above the level of the trunk. Sores on the lower limbs are always difficult to manage. The reparative process is tedious, on account of their situation; the parts are at a distance from the centre of circulation, their action is weak, the return of blood is tardy, and the same facility is not afforded of restraining the motions of the part as in the upper extremities. In persons of a good constitution, however, the simple purulent sore often heals speedily, even in the lower limbs. Before cicatrisation can take place, it is essential that the granulating surface should be on a level with the sound surface around; this soon takes place when a favourable position is observed, and the part is kept at rest; but by neglect, the new matter is often absorbed. Again, the healing process cannot advance where the granulations are exuberant, large, and flabby, and have risen above the proper level: they must be kept in check by due compression, and by astringent lotions, containing salts of zinc, copper, &c. The constant meddling with sores, the touching them with this, that, or the other caustic, is much to be reprobated. Should it be necessary to destroy granulations, and bring them down to the surrounding surface, one good rubbing with the blue stone will generally suffice. If the ulcer is large, the granulations close to the cicatrix should only be destroyed, leaving the centre to be dealt with as the cure advances.

During the cure, the patient must be a good deal confined to the recumbent posture; when erect, a bandage or laced stocking must be applied to the limb; thus the return of blood is assisted, swelling is prevented, and the affected parts placed in a state of comparative rest. Much pressure ought to be avoided, as it is apt to produce bad effects upon the sore, causing absorption of the granulations, thin bloody discharge, and great tenderness of the surface. After cicatrisation, the scars may be absorbed, and sores reproduced, by external injuries, or an unhealthy state of the body; and so much does the state of a sore depend upon that of the general health, that the one is a good index of the other.

II. In the second class of sores, or those with weak action, the granulations are flabby, of a pale colour, and possessed of little sensibility or vascularity; the discharge is gleety, and the surface is liable to be destroyed by ulceration or sloughing, upon the slightest excitement of the circulation in the part. The surrounding integuments are generally of a bluish colour, in consequence of their separation from the subjacent parts; and in several places of the neighbourhood, small, unhealthy, detached abscesses may exist; at some points of the sore, glairy fluid is seen to ooze out on pressure, and a probe can be passed pretty deeply into the cavity of an abscess in the soft parts beneath. These sores may arise from an unhealthy condition of the cellular tissue, taking place spontaneously, or following slight injury; they are attributable to the state of the constitution, and may result from an ulcer, originally of a healthy character, which has remained long open, in consequence of its great size, or other impediments to its contraction.

It is the business of the surgeon, in cases of this description, first to obtain a sound foundation, by destroying the unhealthy skin and cellular tissue; the free application of caustic potass will answer this end most readily and effectually. Its application is attended with considerable pain, but the practice is more successful and less severe than the removal of the unsound parts by the knife or other means. The small abscesses may be all freely laid open; the diseased cellular tissue may be cut into, or cut away; in short, incisions may be made in all directions, and in every portion of the affected part; but still it will be found that the granulations, as they appear, become pale and flabby, that they spring from a loose and powerless base; matter will again collect; the surrounding skin will again be undermined; no progress will be made towards soundness. But by attention to the state of the constitution, and the application of potass, the neighbouring sound parts have their actions roused, and the healing is carried on rapidly. After its application, a poultice may be applied for a few days, and followed by water dressing, and then stimulants, both internally and externally employed according to circumstances, the parts being all along well supported. The long continued use of warm fomentations, or poultices, is prejudicial, as tending to diminish still farther the action of the parts; ointments can be of little service, and will generally do harm.

III. Indolent ulcers, which have long existed, are frequently met with on the lower limbs. Their margins are thick and insensible — their surfaces smooth, hollow, and of a pale colour — the discharge is scanty, and adheres to the surface. A sore, having been long open and neglected, degenerates into this state. Poultices are to be applied for a day or two, to clean the surface, promote the discharge, and soften the callous margins. This is the more necessary, if, as is often the case, the sore, or the surrounding integuments, are inflamed when the patient applies for relief. Afterwards, the applications must be of such a nature as to moderate the discharge and keep the granulations firm and healthy. In such cases only is adhesive plaster applicable, and in them it produces the most beneficial results. Supposing the ulcer to be situated on the fore and middle part of the leg, a bandage should first be firmly applied from the toes to a little below the sore; the ulcerated part of the limb is then encircled by narrow strips of adhesive plaster, tightly drawn, and with the extremities of each strip crossing immediately over the ulcer. A pledget of tow is placed on the plasters to absorb the discharge, and the bandage is brought over dressings, and continued for some way upward. By this application, the margins of the sore, it is supposed, are brought nearer to each other, and the ulcerated surface diminished; the sluggish granulations and the subjacent parts are stimulated, and a more vigorous action being excited, the process of reparation proceeds speedily and effectually; the surrounding parts, previously turgid and œdematous, are by the pressure brought to the same level with the newly-secreted matter, and new skin is quickly formed. In the previous state of matters, the old skin was much elevated, and an action was in progress, causing a continuance of that elevation; by the compression, the whole limb is properly supported, serous effusion prevented, absorption excited, and œdema removed; the livid swelling of the lower part of the limb, which might arise from the tightness of the adhesive plaster, is obviated by the bandage being first applied. A feeling of uneasiness in the limb sometimes follows such dressing, but is of short duration; should it increase, so as to amount to pain, the elevation of the limb and the pouring of cold water occasionally over the dressings will soon restore the parts to comfort. Or the adhesive plaster may be slit up behind, immediately after its application; indentation of the limb being thereby avoided, and sufficient pressure at the same time kept up on the sore. If possible, the dressings ought not to be removed before the second day, as much irritation will be produced by their frequent renewal. The benefits arising from this mode of treatment are truly surprising; the slow and indolent ulcer is speedily converted into the simple purulent sore; the white and recent cutaneous substance encircles small pointed and florid granulations, which bleed from the slightest rudeness of touch; and the space formerly occupied by an unsightly sore is soon diminished to a small and firm cicatrix. It is only necessary to continue this mode of dressing so long as the granulating surface is below the level of the surrounding surface. Then the object being attained, the deranged state of the cellular tissue being got rid of, and the ulcer put in a state favourable for cicatrisation, the sulphate of zinc lotion not over strong may be resorted to; positive rest and support of the affected part being still enjoined and observed. In the old and debilitated, however, in whom the indolent sore most frequently occurs, the integuments remain purple and shining, and from very slight causes the cicatrix is absorbed, and breach of surface is reproduced.

These sores are often connected with a varicose state of the veins. In all such cases, a degree of compression on the affected limb must be maintained, both during the continuance of the sore, and after it has healed. The usual situation of such sores is on the leg, and the varicose state of the veins does not, in general, extend above the knee; in such cases, a radical cure may be attained (provided the patient wishes to encounter the attendant risks, rather than submit to a continuance of the disease) by effecting an obliteration of the saphena major vein. The manner of doing this, and its effects, were mentioned while treating of diseased veins. In some cases, the saphena minor is also varicose to some extent, the varices on which must also be obliterated. Sometimes as many as eight or ten needles must be applied, in pairs, before the circulation of a limb can be brought into a right state.

IV. In this fourth class of sores, or the irritable from over-action, the sore and its edges are of a jagged, irregular appearance, the discharge is thin and bloody, and considerable pain is experienced. This ulcer is very superficial, involving only the surface of the corium and the more sensible part of the integument, the papillæ, and extremities of the nervous filaments. They often succeed to scaly eruptions, and present a remarkable character and appearance, cicatrising in the centre, whilst they extend towards the circumference. The sore is often covered by an ash-coloured slough; on the removal of which, granulations arise, but these either again slough, or are removed rapidly by the ulcerative process. In the treatment of such sores, complete rest and soothing applications are the means on which most reliance is to be placed. Warm and soft poultices, such as those of arrow-root, fomentations, tepid water dressing, solutions of opium, or of extract of poppy, and the occasional use of a local vapour bath to the part, may be enumerated amongst the means best fitted to allay the irritable condition of the ulcer. When the surrounding integuments are swollen, red, painful, in short, evince marks of inflammatory action going on in them, the feelings of the patient will be rendered grateful, and the cure advanced, by abstraction of blood from the parts by punctures. When the nature of the sore is changed, and when cicatrisation has commenced, the treatment is similar to that of a simple granulating surface — light dressings, due support of the parts, and repression of exuberant granulations by the sulphate of copper. The nitrate of silver, applied in substance round and about the ragged edges, is of great service at an earlier period. This practice must be sparingly and seldom resorted to, but it does wonders when judiciously employed.

Ulcers are occasionally prevented from healing by the presence of dead portions of tendon, fascia, or cellular tissue, and are accompanied in general with a bad state of constitution; in such it is necessary to clean the surface by a powerful escharotic, and the best is potass. Otherwise, granulations will be produced quickly, it is true, and in abundance, to supply the original substance; but then they are flabby and exuberant, new skin is formed slowly, if at all, and the sore does not contract; but by removing the dead or half-dead surface, a healthy and firm foundation is prepared, on which is securely and gradually raised the new matter for cicatrisation. But caustics are applied injudiciously to firm and healthy granulations which have not yet reached the level of the surrounding parts; they are only useful in repressing exuberant granulations, or in destroying half-dead parts, which interrupt or deteriorate the cure: and when employed, it should be effectually, and once for all.

Along with the topical treatment of ulcers, internal means are, in most cases, indispensable. Thus, in indolent ulcers, the state of the constitution is often sluggish, and ought to be changed by the exhibition of alteratives or stimulants; with this view, much benefit is derived from a prudent and restrained use of mercury, from the lytta vesicatoria, from minute and occasional doses of arsenic, from the free exhibition of sarsaparilla, and from generous diet, porter, and wine. It is however, altogether impossible to lay down fixed rules for the management of sores; every one has some peculiarity in its nature and appearance, every one requires some peculiarity in the applications and mode of dressing, and what may suit well one day will often prove inert or injurious on the succeeding. Again, when any one application or internal remedy is found to agree with the sore, it ought not to be changed for fashion's sake, from caprice or routine. In this department of surgery, one practitioner excels another, not by his superior knowledge of the various applications, but by his acuteness in selecting the remedy adapted to the particular state of the sore, and in accommodating the various ointments, lotions, or powders, to the different characters which the ulcer assumes during its progress. The healing of sores is very easy in some constitutions, and very difficult in others. Hence, it has been supposed that the long existence of a sore is a salutary process of nature, tending to relieve or prevent some more serious affection, and on this account some are little solicitous to procure its cicatrisation, or at least are careful that the cure shall not be a speedy one. If, indeed, an extensive sore, or a series of sores, be suddenly dried up, the circumstance must be considered as very unfortunate, and the consequences may even be fatal; but such an occurrence is unusual, and the patient may in general be saved by the timely insertion of an issue in the neighbourhood of the sore, or by an active employment of what is best calculated to insure a renewed discharge. Some sores have a disposition to extend by sloughing, and such frequently attack the lips and pudenda of weakly children; they are also met with, amongst the lowest class of prostitutes, in the cleft of the nates, in the groin, &c., and in such cases the sore closely resembles hospital gangrene.

OF HOSPITAL OR CONTAGIOUS GANGRENE, AND SLOUGHING PHAGÆDENA.

This disease has been long known, and has proved very fatal in crowded and badly-aired hospitals. It may break out at any season, but hot, sultry, and damp weather is most favourable to it. No breach of surface, however small, is secure from its attack. The wound becomes painful and swollen, and loses its healthy, florid appearance; the granulations are flabby, and appear as if distended with air; vesicles form, containing serum or a bloody fluid; the pain is stinging; the secretions are suspended; and the wound is either altogether dry, or covered with slimy, tenacious, and peculiarly offensive matter. An ichorous discharge follows, the pain increases. The sore assumes a circular form, and its edges are everted; erysipelas attacks the surrounding integuments, often extending over the whole limb, and forming a principal feature of the disease. In fact, violent erysipelas and hospital gangrene are affections very closely allied to each other, often arising at the same time, and from the same causes. Both are accompanied with great constitutional disturbance; but in erysipelas, this generally precedes, whilst in hospital gangrene, it follows, the appearance of the malady. The lymphatic glands, in the neighbourhood of the gangrenous part, inflame and suppurate, the skin gives way, and the gangrene soon seizes the newly-formed sore. Fever supervenes, the pulse is often full and strong, and the surface hot; there is great nausea and thirst; the tongue is brown, and the bowels much disordered. The inflammation and ichorous discharge increase. A thick slough covers the sore, and its fetor is peculiar and intolerable. The burning pain is excruciating. Blood oozes out, and, in the last stage, the hemorrhage is often copious from large vessels exposed by the ravages of the disease.

Now, extensive mortification occurs, the strength fails, the pulse becomes tremulous and indistinct, the features collapse, the surface is bedewed with a cold sweat, diarrhœa and hiccough come on, and death puts an end to the patient's suffering. Such is the progress of the disease in those who were previously in perfect health. Often, however, it is attended with typhoid symptoms almost from the beginning, in people whose constitutions are wasted, who have long laboured under disease, or who have been long confined in hospital. The important distinction between these cases must influence the treatment; what succeeds in the one will destroy in the other. It is not the name of the disease which is to be combated, but each symptom as soon as it presents itself.

Those who have been once afflicted with hospital gangrene are extremely liable to its recurrence, and that too on the same sore; though the secondary disease is much less acute. This form has been termed Sloughing Phagædena, and may seize a sore not previously affected with gangrene. The wound, recovering from the first attack, and appearing to heal rapidly, with good discharge and healthy surface, presents, near its edge, a small dark spot or ulceration, of the size of a small bead or shot, of a circular form, with a ragged edge, excavated surface, and fetid discharge. Several such points may appear; they spread rapidly, unite, and the surface is soon destroyed. It is not uncommon to find one part of the sore of a healthy appearance, and even cicatrising, whilst in another part the surface is rapidly disappearing. The patient complains of a burning sensation in the part; suppuration occurs round the edges and beneath the slough, and the dead parts separate; but the same process again takes place, and another slough forms. The malady proceeds often with a rapid and alarming pace; the sloughs are soft, pulpy, and reddish, and separate one after another, exposing muscles, nerves, bloodvessels, and bones. Joints are opened into, and the vessels, having been exposed, perhaps for a day or two, give way, and fatal hemorrhage ensues, their cavities not being obstructed with coagula as in sphacelus. The patient is sick, has no appetite, and labours under other symptoms of deranged stomach; there is restlessness, with a small quick pulse, and all the symptoms of a weakened and sinking system. The ulceration becomes more rapid, the discharge is bloody and peculiarly offensive; all the symptoms increase in violence, and may proceed for fifteen or twenty days, or terminate in four or five, either in convalescence or death.

Hospital gangrene is supposed to arise from a variety of causes: from the state of the atmosphere, moist and hot — from inattention to cleanliness, the parts around the sore being seldom wiped, the matter collecting amongst the dressings, and becoming acrid by putrescence — from irritating applications, as rancid ointments — from a too stimulating diet, and from the abuse of wine and spirits — from mechanical irritation, in moving the wounded over rough roads and in bad conveyances, as after great engagements — from specific contagion without immediate contact. After being once generated, it is propagated by direct communication, by the application of morbific matter from sponges, dressings, or instruments. It is not easy to say how the disease originates.

In the treatment of this scourge, great attention must be paid to cleanliness in all circumstances. Free ventilation must be constantly preserved in the apartments of the sick, and fumigations assiduously employed. The infected ought to be separated from the others, and but few patients placed in the same ward. Stagnant drains and accumulations of filth out of doors are to be removed; otherwise, during hot weather, the atmosphere becomes much vitiated. Care must be taken, also, to destroy all the dressings which have been used; not to employ sponges, but to wipe the surface in the neighbourhood of the sore occasionally with tow, which is to be burnt immediately, being an article of little value, and easily procured. Too much attention cannot be paid to the cleaning of those instruments with which gangrenous sores have been treated, before they be applied to healthy wounds. As to the constitutional treatment, the alimentary canal must first be purged of its solid contents, and the secretions afterwards kept in as good a condition as possible. When the wound or sore is surrounded with intense inflammation, and when the skin is dry and the pulse strong and full, with all the other symptoms of an inflammatory diathesis, immediate recourse must be had to free abstraction of blood from the system, as thus only can the progress of the disease be efficiently arrested; and if inflammatory symptoms exist, when there is reason to expect the occurrence of the disease, though no symptom of it has yet appeared, then, too, venesection combined with purgatives is demanded, as being the most powerful preventives. Emetics are also recommended. When the affection is from its commencement accompanied with typhoid symptoms, depleting measures must do irreparable mischief: in such cases, the local pain and irritation will be relieved by the exhibition of opium or camphor, and it may also be of service to preserve a perspirable state of the surface by means of Dover's powder, or other diaphoretics. Preparations of Peruvian bark, the decoction with or without the tincture and acid, or the sulphate of quina, are often given with great advantage — opium is also usefully exhibited. Vinegar, weak acids, the nitric and muriatic acids diluted, have been used as external applications, and nitrate of silver, the red oxide of mercury, and the actual cautery, have been applied with the view of removing the diseased parts, and procuring a healthy surface. Arsenic in solution, used so as to produce a slough, followed by hot dressings, has been supposed to be serviceable. A much safer and more powerful application is the strong nitric acid, which sometimes requires to be applied over the diseased surface very freely, and repeated if need be.

THE MALIGNANT PUSTULE

Is a gangrenous inflammation of the skin, rarely extending to the subcutaneous cellular tissue, and in this respect differs from carbuncle, which commences and is seated in the cellular texture. It arises from the application of the fluids of animals which have died of putrid diseases common in some marshy and low situations. It is communicated not only by matter from the diseased part, but also by the blood of the animal; thus it is frequently observed in those who handle the recent skin or flesh; and the excrements also appear to be possessed of the poisonous principle. It spreads from one person to another by contact. There is much reason to doubt, whether carrion introduced into the stomach produces this disease, though by some it is maintained that even the respiration of effluvia from putrescent substances produces malignant fever, with fetid evacuations and gangrenous patches on the skin. In the West of Scotland, an instance occurred some years ago, in which several persons lost their lives from eating the flesh of dead animals which had been washed ashore. The occurrence of malignant pustule is rare in this country. Some time since, I met with a well-marked case in a shoemaker, who had been employed in killing some sickly pigs. Whilst turning over and removing the abdominal viscera of one of them, he had scratched his finger slightly with a pin stuck in his jacket, and he then perceived that the contact of some putrid matter from the intestines caused great pain. On the third or fourth day afterwards, he presented himself with a malignant pustule formed on the hand between the fore and middle fingers. The pain was very intense, and the disease seemed to be fast extending. Active treatment was employed, and the patient had a speedy recovery.

The disease generally attacks the hands, neck, face, or shoulders of butchers and others, who carry, or in some way deal in carrion. It has also taken place in consequence of the hand being introduced into the rectum — a veterinary method of removing scybala — of an animal labouring under putrescent disease. A pustule appears on the part affected, containing a serous or a dark-coloured fluid; and the base ulcerates, extending through the skin to the subjacent parts; at first it is accompanied with a pricking sensation, afterwards the pustule enlarges and becomes brown, and the pain is burning and itching. The vesicle when opened, or when it has burst spontaneously, furnishes a few drops of red serum, and the pain is thereby relieved for a few hours. A hard, moveable, and circumscribed tubercle forms, without alteration of the surrounding skin. The bottom of the sore is yellow, greenish, or livid, and the sensation is that of acute heat and erosion. Phlyctenæ spread around. The tubercle becomes black in the centre, and an eschar forms; the patient becomes irritable and languid. The gangrenous point begins to extend, and that alarmingly; great swelling takes place, elastic, red, and shining, more emphysematous than inflammatory or œdematous. The burning pain is aggravated; the patient has a feeling of weight and stupor; great constitutional disturbance follows, there is slow fever, with a small pulse, a dry and brown tongue, and unquenchable thirst; a low muttering delirium ensues, and under these symptoms the patient soon sinks. After death, the fetid body swells rapidly. The disease sometimes terminates fatally in twenty-four hours or less; but generally the patient's sufferings are more protracted. In the treatment, superficial scarifications are of little avail. The only topical application which can be relied on is a powerful escharotic, applied freely to the part, and at an early stage, before swelling and constitutional affection have been added. By it the parts replete with virus, being immediately deprived of vitality, are soon thrown off. Thus the virulence of the poison is annihilated, it is rendered inert, and is concentrated in the slough, and the surrounding parts are stimulated, and receive vigour of action, which enables them to resist any further inroad, and to detach quickly the mortified substance. For this purpose, the most effectual and convenient escharotic is the caustic potass, but the liquid muriate of ammonia may also be employed. The vesicle is opened, and the caustic applied to the exposed surface; and if necessary, the eschar may be afterwards divided, and the remedy reapplied. In the absence of other escharotics, the actual cautery will prove a valuable substitute. After the separation of the slough, the sore is to be dressed with slightly stimulating applications. Bark, camphor, and mineral acids, are given internally, and the patient is enjoined a light diet, with a moderate allowance of wine.

OF ULCERS OF THE GENITAL ORGANS, AND THEIR CONSEQUENCES.

It were unprofitable to enter here upon the History of Venereal Affections, as it is a subject of no practical utility, still involved in uncertainty, and mystified by disputation. It will suffice to describe the different forms of the disease, and state the treatment applicable to each.

During the last century, and in the beginning of this, much greater ravages were produced by the disease than at the present time; and though this may be, perhaps, partly owing to a change in the poison itself, it is mainly attributable to the mildness of the measures by which it has been, and is, opposed. Every form of the affection, as soon as it appeared, was at one time opposed by a counter poison, mercury; and the practitioner, relying implicitly on this mineral as a specific, and not being fully aware of its dangerous properties, continued to gorge the system with the supposed remedy, subverting the constitution of his patient, making, in many cases, no impression on the disease, but still persevering in the use of a poison equal, if not more potent, than the one which it was intended to destroy. The change of treatment has been propitious to our science and to mankind. But let it not be inferred that mercury now is, or ought to be, entirely dismissed from the treatment of this disease, or from practice generally: often no other means are effectual; but it should always be prescribed most cautiously and sparingly.

The effects of the venereal virus are divided into primary or local, and secondary or constitutional; and these present a great variety in their appearances, characters, and tendencies. They are sometimes modified by the constitution, or by the remedies ordered in the first stage; but there can be no doubt that different poisons exist, producing distinct kinds of ulcers, which again are succeeded by different constitutional affections.

The most common kind of sore is the *simple ulcer*, at first excavated, in consequence of the process of ulceration continuing; afterwards the ulceration stops, and granulations, somewhat fungous, supply its place, so that the surface is raised above the level of the surrounding parts, and has a smooth, soft appearance; there is no hardness of the edges, and there is no tendency to slough or extend by ulceration. Sometimes it commences in the form of a pustule, which soon gives way, discharging its contents, and leaving an exposed surface, in which the process of ulceration quickly proceeds; but often it arises from simple abrasion of the surface. Different forms of sores may exist on the glans and prepuce at the same time; and it is maintained, that one sore may produce another of a different kind, and the same is asserted with regard to eruptions. The simple ulcer, as well as other sores, is produced by the contact of secretions, generally morbid, but often apparently healthy, with a susceptible surface. Sores, with eruption and sore throat, sometimes appear in one or both individuals immediately after marriage, and probably arise from the acrimony of the female secretions causing tenderness and ulceration of the parts. The application of gonorrhœal matter readily produces the simple ulcer on the glans or prepuce, particularly if an abrasion or rawness existed; and if the matter be allowed to remain on an unbroken surface, a pustule will form, and ulceration follow. From this latter cause numerous sores are produced, separated from each other by sound parts, and not extending into one continuous ulcer; and this condition may have been preceded, on the glans, by a rawness of the surface and a profuse discharge, or by a herpetic eruption on the mucous lining of the prepuce. One man may be affected with gonorrhœa, and another with ulcer, from connection with the same female, the same day or hour; and it is doubtful whether the effect is not similar, in both cases, viz., ulceration; for it is supposed, that in gonorrhœa, the discharge, in some rare cases, proceeds from patchy ulceration of the mucous lining of the urethra, similar to the ulceration usually met with on the glans. In examining women who have communicated infection, very often no sores are found, and but little unhealthy discharge. In short, the simple elevated sore may arise from the application of secretions from an unbroken surface, from inoculation of matter from a similar sore, or spontaneously, from inattention to cleanliness. Sores with elevated surface, more extensive than those of the glans and prepuce, occur on the skin of the penis and scrotum, or in the folds of the thigh; and in women they are often met with in the perineum, or the cleft of the nates. Sores of different kinds arises at various periods after the application of their cause, from a day or two to some weeks, or longer, but the usual time may be said to be from four to eight days. The duration of the simple elevated sore may be modified by various circumstances — by the constitution of the patient, his mode of living, and the attention paid to the affected part. It seldom remains open above a few weeks, but occasionally it may be seen unhealed at the end of several months in those who lead careless and irregular lives.

Such ulcers produce, as readily as any other sores, enlargement of the inguinal glands; they are a source of irritation, the effects of which may be extended along the lymphatic vessels, to the cluster of glands through which the absorbents pass, so as to cause inflammatory action, ending in indurated enlargement; or venereal virus from the sore may be taken up by the lymphatics, deposited in the glandular structure, and produce a similar affection. Buboes thus caused are situated in the upper cluster of inguinal glands; if the lower cluster is affected, it is to be presumed that the cause is not in the organs of generation, but in some part of the inferior extremity. From the existence of bubo, nothing can be deduced as to the nature of the poison, or the probable effects to be produced on the constitution; for enlargement of glands in the course of their lymphatics will occur from irritation, whether connected with a mild or malignant virus, or with one totally devoid of any poisonous quality.

From the simple ulcer there arises a constitutional affection, in all respects resembling that which follows gonorrhœa (a disease which will be treated of under affections of particular mucous surfaces); but before attending to this, it will be proper to advert to another form of ulcer, which differs but slightly from the preceding in primary and secondary symptoms. It is a sore with a brown surface, either on a level with, or above the surrounding parts, with defined and elevated edges, with no cartilaginous hardness of base or margins, and with no tendency to spread either by sloughing or by ulceration. Such may occur in the same situation as the simple sores, but they often form on the outer surface of the prepuce, or on the scrotum; and are not unfrequently met with round the orifice of the prepuce, which is a most troublesome situation, as, in healing, they generally produce phymosis. Sores and fissures in this situation are very often kept up by the tense and irritable state of the aperture. The bubo which follows this differs from that caused by the simple sore, in having, after ulceration of the integument, a greater disposition to burrow; and this tendency is more marked where mercury has been employed. From either of these forms of ulcer, it sometimes happens that constitutional affections arise, either during the existence of the sore, or some weeks after it has cicatrised.

The usual secondary symptoms are those attendant on a papular eruption. There is fever, with pains referred to the head, to the joints, chiefly the larger ones, and to the chest, which latter symptom is sometimes attended with dyspnœa. This indisposition is followed by the appearance of a papular eruption, termed lichen, on the face and trunk, the extremities being less thickly studded. The fever subsides in a great measure after the eruption appears and comes fully out; but fresh crops of papulæ may appear, and, in this case, the fever continues little abated until the eruption begins to fade. The eruption consists, in the first instance, of simple elevations or pimples of a red colour, and these do not appear at once, but gradually: so that some have assumed the form of cones, with minute collections of matter in their apices, whilst others are mere elevations of the cuticle. When they fade the spots are of a copper tint, and become covered with thin scales, in consequence of the cuticle desquamating; but this latter appearance can never be confounded with the scaly eruptions following another description of primary sore. In all cutaneous eruptions, attended with any febrile action, there is a tendency to sore throat, with tenderness of the eyes; and this eruption is not exempt from a similar affection: the fauces feel raw and tender, and are pained in deglutition; on looking into the throat, the mucous surface is found red and swollen, and the tonsils are generally enlarged; but there is seldom any breach of surface; and, when this does occur, it is rather entitled to the appellation of excoriation than of ulceration. Occasionally the surface is covered with a thin coating of lymph, and sometimes this is confined to the situation of the mucous crypts, so as to give a false appearance of small sores. As in similar affections, unconnected with any discoverable cause, the lymphatic glands, at the angle of the jaw, are not unfrequently swollen and painful.

Such is the usually mild character of this affection; but if its progress has been interrupted by any means, more particularly by mercury, it assumes a more complicated form, and a less tractable nature. If that mineral is administered in the usual style, and at the commencement, when the fever and other symptoms are high, the patient's sufferings are all much aggravated. After the fever has subsided, the eruption will often be found to disappear under the use of mercury; but it is extremely apt to recur, as soon as the system has shaken itself free from the effects of that medicine. The mercury produces an irritation, which supersedes the eruption, but by frequent repetition its effects on the system diminish: it at last fails to create an irritation more powerful than the disease to which it is opposed, and, consequently, the eruption does not yield, but during its use is frequently reinforced by fresh crops of papulæ. If the eruptive fever, and advanced stage of the disease, are imprudently and suddenly arrested by the use of mercury, by exposure to cold, or by other means, inflammation of the iris or joints often follows, of a very violent form, and not to be easily moderated. No one thinks of repelling measles or other eruptive diseases, and with good reason, for such practice would almost certainly induce serious affections of internal organs. For the same reason, every precaution must be used to allow this form of eruption to take its own course, while we merely regulate the constitutional symptoms as they obtrude.

Another form of eruption, which occasionally, though much less frequently, results from either of the above mentioned sores, is the pustular. It is preceded by fever, and consists of rather large pustules, separated from one another, and not very numerous. After their apices give way, and the contained pus is discharged, a thin scab is formed, and on its separation a small ulcer is left, which in general soon heals from its margins, leaving a dark-coloured spot to mark its situation. The papular and pustular eruptions are sometimes blended; a few pustules appearing amongst numerous papulæ, or *vice versâ*. The pustular disease is not of frequent occurrence; and in proportion as it approaches the papular, with desquamation, it becomes milder and more easily removed. In it, as in the papular, mercury proves injurious.

The phagedenic form of ulcer is the most dreadful and unmanageable of all; most uncertain in progress, and direful in event, and often rendered still more destructive by the mode of treatment adopted. Fortunately, it is now seldom seen, though not long ago it was well known, as a perpetrator of dreadful havoc, under the name of black pox.

It is a corroding ulcer, without hardness of the surrounding parts, presenting no appearance of regeneration of the tissues which have been destroyed. It may follow either upon a pustule or an abrasion. Sometimes it destroys the prepuce and glans in a few days, or again, when chronic, it spreads deceitfully, healing at one part and destroying at another. The ulceration is often deep, penetrating the corpora cavernosa, or the corpus spongiosum urethræ: in such cases it is followed with violent hemorrhage, which often produces a great and sudden improvement in the sore. After slow cicatrisation it not unfrequently happens that the scar gives way, and the ulceration returns.

Sometimes another character is given to the sore, by the rapid sloughing of the parts. In this modification, a small black spot is first observable, unattended with pain: it enlarges rapidly, and, after no long time, the mortified part separates, exposing an unhealthy surface, which is immediately attacked and progressively destroyed by phagedena. The part may again slough, and, by an alternation of mortification and phagedenic ulceration, the external organs of generation, male or female, may be wholly destroyed. In the present day, however, its ravages are much less extensive and more easily combated than formerly, and it seldom, if ever, proves fatal. One very troublesome case is in my recollection, where the patient suffered two attacks at the interval of two years. During the progress of the disease he was seized with delirium tremens; a bubo formed and ulcerated; a violent hemorrhage occcurred from the sore; sloughing and phagedena alternated; and both prepuce and glans were entirely lost. An eruption followed, accompanied with ulceration of the throat and nostrils. He recovered much mutilated. Ulcers originally of a simple character may become affected with phagedena, or sloughing, from the state of the constitution, from mismanagement, or from exposure to an unhealthful atmosphere. But in such cases, after the separation of the slough, the exposed surface is found to be of a healthy granulating character, contrary to what is observed in the originally phagedenic disease. Buboes, when they occur, have the same malignant action as the primary sore: the breach of surface is extended either by sloughing or by phagedenic ulceration, and the edges of the sore are ragged and undermined.

The secondary eruption which follows the phagedenic form is pustular, though differing from that which has been already noticed. The pustules soon give way, and ulcers remain, covered with thick scales or crusts, which sometimes increase, layer by layer, so as to become prominent, dense, and of a conical form, — the rupia prominens. After the separation of the crusts the ulcers are found, superficial, rather unhealthy, and showing a disposition to extend, chiefly towards the circumference. When healing, the process of cicatrisation frequently proceeds from the centre of the sore, which is still enlarging at its circumference. The reason for this unusual mode seems to be that ulceration does not commence in the secondary sores till the crusts which cover them have been removed : they then are very superficial, not extending through the thickness of the true skin; and the ulceration does not go on in the centre of the original sore, but towards its margins, so that a portion of true skin remains in the centre of the sore, whilst it is gradually destroyed towards the margins. Then, whilst the surrounding skin, which usually forms the new cutaneous texture necessary for reparation, is gradually and progressively destroyed, the remaining old skin in the sore assumes an excited action, as in ordinary cases, and from it the requisite new texture is formed, and gradually extends over the surface, until it meet with a similar substance, which has been produced by the surrounding skin after the ulceration in that quarter has ceased. Thus the general principle that skin is formed by skin is, even in such instances, found to be correct; the healing from the centre not following, as some have supposed, the complete destruction of the cutaneous tissues, but from its having remained unaffected, or nearly so. The appearance of the eruption is preceded by general indisposition, and occasionally by smart fever. It is sometimes extensive, but is in general confined to the upper parts of the body.

Ulcers of the throat occur, of a very alarming kind, quickly destroying the parts attacked, spreading chiefly towards the posterior part of the fauces, rapidly extending to the pharynx and to the nostrils, and in some instances also involving the larynx. The pendulous velum of the palate and the tonsils are often wholly destroyed, the bones of the nose, more especially the turbinated, are deprived of their coverings, and exfoliate, the osseous and cartilaginous portions of the septum are discharged, and the nose becomes sunk, or is supported merely by the columna. The patient's breath is fetid, respiration is in some degree obstructed, a foul ichorous discharge flows from the nares, and the surrounding parts are inflamed, swollen, and excoriated. The countenance is greatly disfigured. On looking into the throat, nothing is seen but an extensive ulcerated surface covered with white adherent matter, and exhaling an offensive fetor, particularly when the bones are affected. Respiration is nasal, and the speech indistinct. When the larynx becomes affected, the patient may be almost considered as lost: phthisis laryngea is established, the symptoms and treatment of which will be afterwards mentioned. The mutilating affection of the nose does not seem to be produced by any other form of the venereal disease, if not in any way aggravated. Along with the eruption and its after effects, severe pains in the articulations, particularly in the knee-joint, often occur, and are always much increased during the night. Nodes seem to be produced only in those cases in which mercury is exhibited; their most usual situation is on the fore part of the tibia; severe pain is felt in the part, which becomes slightly swollen, and of a bright red colour; the swelling feels dense and firm, being a simple enlargement of the bone. They often occur when the patient is taking mercury, and when, in fact, the constitution is completely saturated with it. This medicine may interrupt the progress of the disease, may remove the eruption and the ulcers of the throat, but it at the same time transfers the disease to deep unyielding parts, to the bones and their coverings, and the fasciæ.

The last distinct form of the venereal disease is the scaly — syphilis, or true pox. The primary sore, termed a chancre, "is somewhat of a circular form, excavated, without granulations, with matter adhering to the surface, and with a thickened edge and base. The hardness or thickening is very circumscribed, not diffusing itself gradually and imperceptibly into the surrounding parts, but terminating rather abruptly." Such is the appearance generally presented by the sore when situated on the glans and prepuce. It generally commences in the form of a pimple, without much surrounding inflammation. Sometimes the ulcerated surface is very inconsiderable, but there is always the abrupt and remarkably dense thickness which serves as a distinguishing mark. The non-syphilitic ulcers may have surrounding hardness from the first, or in consequence of the application of stimulants and escharotics; but this is diffused into the neighbourhood, and is not, it is said, of that remarkable solidity peculiar to chancre. It is seldom that more than one chancre occurs: the usual situation is on the glans and lining of the prepuce; but they occasionally form on the outer surface of the prepuce, and on the dorsum penis. In the latter situation the sore assumes a somewhat different appearance: it is, in general, larger, the hardness of the base is not so great, the excavation is less, and the surface is of a livid hue. When allowed to proceed uninterrupted, the livid surface is alternated with that of a light brown or tawny colour. Chancre is an indolent ulcer when compared with the phagedenic or sloughing sore, the ulceration proceeds very slowly, and, in proportion as it advances, the surrounding hardness increases. It is also contumacious and obstinate in taking on any reparative action. Phymosis occasionally takes place, in consequence of chancre situated at the orifice of the prepuce, but not so frequently as when that situation is occupied by superficial sores of a more active nature. Bubo sometimes appears in both groins, or in one; sometimes on the same side with the sore, often on the opposite, and not unfrequently when the sore is healing, or after it has healed. It may suppurate and give way, or may subside without having advanced to suppuration. It differs in no respect from the swelling of the glands from other causes, either in its swelled or open state. Neither does the occurrence of a bubo render it more probable that constitutional symptoms will follow. Enlargement of the glands is often caused, or at least hastened, by the patient continuing to walk about and exert himself during the existence of a sore, and whilst the absorbents are in an irritable state; but a bubo may be caused by irritation or excoriation in any way produced; and it not unfrequently occurs without any apparent cause. In some cases of chancre or other ulcer, the absorbents along the dorsum penis become swollen, and occasionally suppurate. In former times, it was not uncommon for the surgeon to insist that all swellings in the groin were venereal, though no primary sore had ever existed: the virus was said to be absorbed from an unbroken surface; the patient's system was saturated with mercury; and the use of that medicine was persevered in, with the view of opposing those symptoms of a ruined system which itself had produced. Such delusions have now happily passed away.

The eruption which follows the chancrous form of primary sore is scaly from the commencement, and by this character is readily distinguished from every other venereal affection. It is generally preceded by an efflorescence or discoloration, rendering the skin of a mottled appearance. The scaly eruption is a form either of lepra or of psoriasis. The patches usually do not exceed a sixpence in size, are distinct and separate from each other; their base is of a dark red or coppery hue, the affected skin is not hard or rough, but soft and pliable, and seldom covered with crusts; as they extend, the edges are slightly elevated at the centre, which alone is covered with thin white scales, appears flattened and somewhat depressed; when they begin to fade, the margins shrink and become paler, and desquamation proceeds slowly; a circular, purplish-red discoloration, with a central depression, remains for some time after the blotches have declined: the depression is permanent, but the discoloration disappears. The smaller patches, which assume a variety of forms, continue for some time of a dark colour, extend towards the circumference, become pustular, and at length ulcerate superficially, enclosing an area of sound skin. When depressions of the skin, as the folds of the nates, are affected, a scaly eruption does not take place, but soft and moist elevations arise, discharging a whitish matter, varying in form and size, and accordingly receiving various appellations, as condylomata, fici, or marisci. From them a secondary form of disease is occasionally communicated. If no decided treatment is resorted to, and if the eruption is consequently permitted to follow its own course, thick crusts form, ulceration proceeds beneath them, the matter is confined, and the patch becomes prominent. Another secondary symptom of chancre is ulceration of the throat, sometimes extensive, but generally situated in the tonsils, or their immediate neighbourhood. The ulcer is not preceded by much pain or swelling: "it is a fair loss of substance, (part being dug out, as it were, from the body of the tonsil,) with a determined edge, and is commonly foul, with thick matter adhering to it, like a slough, which cannot be washed away." Such ulceration may be simulated by excavated sores attending the phagedenic form of disease; and it ought to be more especially distinguished from an affection to which the tonsil is extremely liable, irregularity of its surface, enlargement, and effusion of lymph, in consequence of chronic inflammation.

A more serious part of the secondary disease is affection of the deep-seated parts, ligaments, periosteum, and bones. The bones nearest the surface are principally affected: a swelling gradually forms on the tibia or ulna, without discoloration of the integuments, and without pain occurring till after a long time. The pain is most severe during the night. The inflammation of the periosteum is often very violent, the subjacent bone, as in the head or extremities, becomes dead, and exfoliates; but it remains to be seen whether this will take place when mercury is more sparingly, if at all, administered. Ulcers betwixt the toes, occurring along with the above symptoms, are supposed to be venereal: they are unseemly, and peculiarly fetid.*

Such are the affections, local and constitutional, arising from a venereal cause; but the latter may be simulated. Many affections of the skin, mucous membranes, and bones, resembling the venereal disease, may be produced by disorder of the constitution, by a decay of the digestive organs, by unwholesome food, and exposure to inclement weather, by inattention to cleanliness, and many other circumstances. Morbid poisons, not venereal, but of various kinds, may exist, and cause much mischief.

A disease resembling syphilis was produced by the cruel practice of transplanting teeth from sound people into the jaws of persons in the higher ranks of life, whose corresponding teeth were decayed. The latter were the affected party, and that justly.

A very infectious disease was at one time common in the poorer parts of Scotland, and known under the name of sibbens, or sivvens, chiefly occurring amongst the poor, ill-fed, badly-clothed, and worse-housed people in the Highlands. It was communicable by very slight contact by kissing the lips of an infected person, smoking the same pipe, drinking out of the same cup, or using the same spoon. Cases of it are still occasionally seen. There are ulcers of the lips, mouth, throat, and nose; ulcerated patches and warty excrescences in the cleft of the thighs, in the axilla, and round the anus and pudenda. A pustular eruption appears, and terminates in hardened crusts. The same disease is known in Ireland, under the name of button-scurvy; and a similar one, called raddesyge, has been described as occurring on the sea-coasts of Norway and Sweden. In Canada, also, something of a like nature was at one time prevalent. The yaws, at one time common and destructive in the West India Islands, appear to be much of the same nature. Some of these diseases, more particularly sivvens, are very common amongst children. Even in these days children are not unfrequently born with copper-coloured blotches of the skin and desquamation of the cuticle; or they may come into the world with these appearances, along with affections of the mucous membrane, hoarse voice, redness round the anus, &c. These are forthwith attributed to a syphilitic taint existing in either of the parents; and one or both are put under mercury; but child after child comes into the world in the same plight. Again, the disease is communicated by children to the nurses, and *vice versâ.* All these affections are rendered much more obstinate by full courses of mercury: the bones and ligaments become affected in consequence; but small doses of that medicine may prove useful towards the decline of the disease.

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* [The above symptoms, together with deep-seated tubercles of the skin and mucous membrane, constitute what Mons. Ricord has lately described under the name of *tertiary* syphilis. They seldom make their appearance under fifteen or eighteen months after the formation of primary sores, and some cases occur even after the lapse of many years. From two to three years may perhaps be considered as the average period for the development of the tertiary form of the disease. This, however, is still an unsettled point. — Ed.]

Some have believed mercury a certain test of syphilis; maintaining that the disease, still checked by the specific, is never overcome by the constitution; that it is unchangeable, and regularly and progressively grows worse, where no mercury is employed; that, opposed by that medicine, it is stationary, and is permanently cured by adequate mercurial influence on the constitution. Whatever were the appearances, if they went off under mercury, the advocates for this practice set them down as those of syphilis, lues, or pox. If they did not yield to that mineral, they were termed syphiloid, pseudo-syphilitic, or mercurial; for they did admit, now and then, that their favourite remedy produced unpleasant effects. Such theory and practice are now very happily exploded.

As to the *treatment* of local venereal affections, it may be, in the first place, remarked, that prevention is better than cure. The means employed for accomplishing this end are very various: oily applications, alkaline and spirituous washes, &c., with the view either of preventing the matter from coming into contact with the genitals, or of completely removing it, when it has been but a short time applied. There is one certain method of avoiding disease, which it is unnecessary to mention. In all affections of the penis, it is of the utmost importance to keep its extremity bound up to the abdomen, in order to prevent congestion or inflammatory swelling. Celsus knew this well; "Sursumque coles ad ventrem deligandus est, quod in omni curatione ejus necessarium est;" rest and quiet must be strictly observed; the patient must be confined to the recumbent position, particularly when the sore is irritable, when swelling or bubo has occurred or is threatened; and when the system is excited, and the eruption has commenced, the bowels must be kept gently open, the patient's diet must be low, and the parts surrounding the sore are to be kept carefully clean. Whatever the nature of the ulcer may be, it is safe and prudent, in the first instance, to change its action by the use of the nitrate of silver, or to destroy the surface by the free application of escharotics, as nitric acid, or solution of nitrate of mercury: the morbid poison is thus got rid of, and the surrounding parts stimulated to a proper degree of action. This is absolutely necessary in the phagedenic form of ulcer, whether of an acute or chronic nature. But, in most cases, the patient does not apply for medical assistance till the sore has been of so long duration as to preclude all hope of counteracting the virus by any local application. The simple superficial sores, and those with elevated margins, must be treated on the same principles as if they were totally unconnected with any specific cause; and the applications must be varied according to the peculiarities of the part affected, and the different appearances which the surface assumes during the progress of cure. Lotion is the form of application found preferable in most cases, and may consist of calomel and lime-water, with mucilage, called the black wash; of muriate of mercury, with lime-water, called the yellow wash; of a solution of sulphate of zinc, with spirit of a solution of nitrate of silver, or of sulphate of copper. The linimentum æruginis or Barbadoes naphtha, are often useful in foul sores. Ointments, if at all, ought to be used sparingly. The application of dry lint, or the sprinkling of a little fine powder, is often all that is requisite. Of course these applications must be varied, according to the particular circumstances of each case.

Buboes are to be treated in the same way as any other inflammatory swellings; local means being taken at the commencement to subdue the inflammatory action, and resolve the swelling. Rest is indispensable. When they are stationary, the application of a blister will either cause resolution or suppuration, and so the enlargement will be got rid of, either in the one way or the other. The painting of a rubefacient solution of iodine occasionally on the swelling is also useful, and preferable to frictions with iodine ointment. When they have passed into a decidedly chronic state, absorption may be promoted by pressure, or, again, means must be taken to hasten suppuration, and the matter which forms is to be early evacuated. If suppuration occur in the cellular tissue, and not in the substance of the enlarged gland, neither cicatrisation, nor a permanent cure, can be expected until the prominent and indurated parts have been destroyed by the caustic potass. In phagedena, bread and water poultices or tepid-water dressing are, in the first place, to be applied, and the pain and irritation may be soothed by solutions of opium, or extract of poppy. If bands of skin intersect the ulcerated parts, they are to be divided, as being a source of irritation which prevents healing. If the frænum præputii be surrounded by ulceration and undermined, it must be incised for a similar reason. It is often advisable, also, to divide the prepuce. After the process of destruction has ceased, gently stimulating washes will promote contraction of the sore.

It is an important fact, that the majority of primary ulcers can be made to heal without mercury. Cavillers object to the mercurial washes, supposing that they may act by affecting the constitution. The sores with hardened edges, chancres, heal as well as others, when mercury is not employed, but much more slowly. In some mercury is injurious: in chancres it promotes the cure. In any case, I would never think of ordering it, unless the progress were very tedious, the ulcer being indolent and contumacious; then mercury may be advantageously used, and moderately continued, until the callosity disappear. It is no easy matter to say, judging from the appearance of the ulcer, whether secondary syphilitic symptoms are likely to arise in consequence of it or not, or what their nature may be should they occur: they follow upon sores of all characters, and, again, do not appear, after what might be set down as the genuine Hunterian chancre. Whatever the nature and appearance of the ulcer may have been in the first instance, should it become stationary, and show no disposition to heal under local means, mercury may then be given cautiously, and with advantage. Considering that very obstinate sores are now seldom met with, it would seem that very little mercury is required in the treatment of primary venereal ulcers. During the progress of acute inflammatory action, this medicine should not be given for the primary affection, whatever the nature of the ulcer. Mercury cannot prevent constitutional affections.

Constitutional symptoms do not often occur, taking place scarcely in one case out of a hundred of all the forms of sores which present themselves. In the *papular* form mercury is hurtful, as already remarked; it interferes with the natural and mild progress of the affection, frequently gives rise to iritis, and produces pains of the joints and bones. The powers of the constitution, aided by simple remedies, are sufficient: the cure may be tedious, but cannot be destructive. Whereas, if mercury be considered as the only specific, its use will be long continued; it will frequently be resumed after it has been dispensed with on the supposition that the virus is destroyed; and by the effects of excessive mercurial irritation, combined with those of the disease, tampered with and aggravated, the patient may ultimately perish. The fever, which precedes and attends the eruption, must be moderated by depletion, antimonial medicines, and purgatives; but depletion ought not to be carried far, lest the eruption be thus checked and disappear; and the patient ought to be carefully removed from external circumstances which might produce a similar effect. After the eruption has come fully out, and the febrile symptoms subsided, it will be sufficient to attend to the general health, and employ the decoction of sarsaparilla, a medicine which excites the secretions, and more especially promotes diaphoresis. In short, the treatment may be said to consist in allowing the disease, in a great measure, to follow its own course, taking measures to prevent it from being interrupted, and merely moderating such violent symptoms as may precede or accompany it.

In the *pustular* form of eruption the general treatment is the same as in the papular. Mercury is hurtful, and increases the tendency to burrow. When the surface is nearly covered with pustules and ulcers in all stages, desquamation may be hastened by fumigations of sulphur, the general sulphur baths, lotions of sulphuret of potass, nitro-muriatic baths, vapour baths, or by smearing the affected surface with equal parts of tar and sulphur ointment.

In phagedena the patient ought to be, if possible, placed in an airy and healthful situation. In most cases free bloodletting may be necessary at the commencement, and will be advantageously followed by purgatives and antimonials. The patient ought to be strictly confined to his room, and ordered low diet with diluents. Afterwards, the internal use of nitric acid, the decoction of sarsaparilla, and an occasional dose of Dover's powder at night, will be beneficial, particularly if sleep be disturbed with pain of the bones and joints. Mercury, even in small quantities, protracts the disease, and in large doses it hastens the ulceration and sloughing. When all febrile symptoms have subsided, when the ulcers are nearly healed, when no fresh pustules appear, and when desquamation is begun, alterative doses of mercury, as a blue pill or grey powder every second night, may sometimes be ventured upon, will tend to hasten the cure, and will not, possibly, be followed by any unpleasant symptoms. The safe course is to promote the secretions by some safe substitute — preparations of sarsaparilla, ipecacuan, taraxacum, &c.

In fact, in all scaly eruptions, whether scaly from their commencement, or having become so in their latter stages and previously to their disappearance, mercury, prudently administered, will be useful by expediting the cure, and not injurious by deranging the system. The tar or citrine ointments may be applied to the eruptions and cutaneous ulcers.

For the ulcers of the throat, unless in a sloughing state, the lunar stone appears to be almost a specific, removing the irritability of the sores, and protecting them from further irritation by coagulating the discharge, which then more effectually covers and protects them. The application requires to be repeated every second or third day, as, by the frequent and necessary motions of the parts, the crust loosens and separates, leaving the surface exposed and irritable. At the same time the sore will contract very considerably under each successive crust. The lunar stone may also be applied in solution; or a solution of the bichloride of mercury in spirits or laudanum may be used, in the proportion of from four to six grains to the ounce, or stronger. The solution of the nitrate of mercury is sometimes employed with advantage. Fumigation of the throat with the red sulphuret of mercury has been extolled as a powerful means of checking the alternating sloughing and ulceration which often accompany the ulcers of these parts, but the propriety of its employment is doubtful; the system is thereby rapidly put under the influence of the mineral, which, as already remarked, generally aggravates the violent disturbance under which the constitution labours. More permanent good may be expected from means taken to remedy the constitutional evils than from such violent remedies as are directed against the affected part, but which also produce a baneful effect on the system. In ulcers of the nostrils, with fetid discharge, snivelling, exfoliation of the inferior spongy bones, affections of the palate, &c., the nitrate of silver is also very efficacious; or the affected parts may be occasionally touched with a hair pencil, dipped in a liniment composed of lime-water, olive oil, and the golden ointment. They ought to be frequently washed with tepid water, and all sources of irritation must be removed. If the patient be in the habit of taking snuff, the practice must be abandoned, and the powder already impacted in the nostrils removed. If there be carious teeth or stumps in the upper jaw, the sores can scarcely be expected to heal till these be extracted, as constant irritation is kept up by them. When the affection proves obstinate, a recourse to mercury is recommended by some writers; but this will make bad worse. Sarsaparilla in these cases, with attention to diet and air, will always prove a better alterative than any form of mercury. It may be combined, according to circumstances, with the nitric or nitro-muriatic acids, or with the hydriodate of potass, in which many practical men have great faith. This medicine is employed in cachexia, following or not the use of mercury, and is directed against eruptions, sore throat, and pains in the limbs.

The constitutional symptoms of the *scaly* disease, or true pox, when they occur, which is now but seldom, are decidedly benefited by a prudent employment of mercury. It may be administered externally or internally, though the latter method is the one generally adopted. It may be introduced into the system under various forms, according to the particular circumstances of the case, or the ideas of the practitioner. The most common form, and the simplest, is the pil. hydrargyri; but for this may be substituted hydrargyrum cum creta, Plummer's pill, or calomel with antimony. In painful affections of the bones, with or without swelling, the muriate of mercury (bichloride) is the form which I have found most efficacious; one-eighth of a grain of the muriate being given thrice a day in a pill; or the medicine may be given in solution. The iodide of mercury is also a very useful medicine in some cases. It is impossible, and would be absurd, to lay down any precise rules as to the quantity of mercury which is necessary for the cure of pox: in some patients the system is with difficulty put under its influence, whilst in others a single grain will produce salivation, constitutional disturbance, and eczema. When the mouth becomes affected the mercury ought to be discontinued: much harm and no good resulting from the medicine being pushed to profuse salivation; the tongue swells hideously, the teeth loosen, and portions of the jaw die and exfoliate. It is sufficient that the system be under the influence of mercury; and that circumstance is marked by the tenderness of the gums. If, after the medicine has been disused, the disease does not appear to recede, it may be resumed in the same moderate way as before; but there certainly can be no use in continuing mercury after the symptoms of venereal affection have ceased. Nodes may still exist, portions of bone may be dying, abscesses forming, and various other changes of structure going on, but these are no reasons for a continuance of the mercury. If they have originated from the venereal affection, that cause has been removed, and the diseased actions will now proceed altogether independently of their original cause. Mercury proved beneficial in removing a disease of which they are not a part but a consequence; and, if that medicine be now blindly persevered in, the only effect will be to ruin the constitution, and thereby greatly retard the cure of those affections which, if the natural powers of the system had been merely supported, or in a great measure left to themselves, would have soon ceased to annoy the patient or alarm the antisyphilitic mercurialist.

Slight swellings and pains of the bones often yield to local abstraction of blood, friction, and the internal use of the compound decoction of sarsaparilla. Nodes, however, sometimes continue to enlarge, and occasion much pain, notwithstanding these means; and in such circumstances much relief will be afforded by a free incision over the affected part, from whatever cause the swelling may proceed. When the pain has subsided, and the swelling remains stationary, a decrease of it may be sometimes effected by a blister.*

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* [It is somewhat surprising that the author has made no mention, in connexion with this subject, of the *iodide of potassium*, so justly lauded by Mons. Ricord and some other French surgeons. For the last two years or more I have been constantly in the habit of employing this article in tertiary syphilis, in mercurial disease of the bones, and

Of the bad effects of mercury on the constitution much might be said. Treatises have been written on mercurial pox, a species reported to be much the most violent; and others have detailed an accumulation of evils, under the title of mercurial disease. There is no doubt that extensive, deep, and sloughy ulcers of the throat are produced by mercury; and of this I witnessed the following unexceptionable instance: — The fauces presented one extensive mass of ulceration, sloughing at its margins, and the uvula was almost detached. The patient was an old and emaciated woman, who neither

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in chronic rheumatism, in which, I am convinced, it is as much of a specific as quinine is in intermittent fever and miasmatic neuralgia. The medicine, to produce its full effects, should be administered in much larger quantities than are recommended in our treatises on the Materia Medica. In my own practice, I usually commence with ten grains, repeated three or four times a day, and gradually increased until it amounts to a scruple, or even half a drachm. Exhibited in doses of this size, it is truly surprising how rapidly, in most instances, it affords relief. Patients who have laboured under nodes and nocturnal pains for months, whose health has become greatly impaired, and who have not slept soundly perhaps for weeks together, have often perfectly recovered under this treatment in less than a fortnight. A very decided improvement generally takes place within the first forty-eight hours, the local uneasiness diminishing, and the sleep being rendered more refreshing. The medicine should not be laid aside as soon as the patient experiences relief, but be continued for several weeks after the symptoms of the malady have subsided. By neglecting this precaution a relapse will occasionally occur. The best vehicle for it is distilled water with a small quantity of simple syrup. Mons. Ricord administers it dissolved in hop-tea, made with an ounce of hops to a pint of boiling water; this is allowed to stand for four hours, when thirty-six grains of the salt are added, and the whole drunk during the course of the day. When given in the large doses above mentioned, it is said to be sometimes productive of diarrhœa or gastric irritation; but no such effects have followed its employment in my own hands, and I presume therefore that they are exceedingly rare. Should they take place, the quantity must be lessened, or the medicine entirely suspended for a few days.

In obstinate cases of tertiary syphilis it may be necessary to exhibit along with this medicine the compound decoction of sarsaparilla, or some of the preparations of mercury, such as the proto-ioduret, deutochloride, or cyanuret. The first may be given in doses of from one-half a grain to a grain, the second, from one-eighth to a fourth of a grain, and the last, from one-sixteenth of a grain to a grain, twice or three times a day. How the iodide of potassium acts in producing its beneficial effects in the diseases in which it is now so extensively used by our French brethren, as well as by some of the practitioners of our own country, has not yet been explained. That it is a powerful alterant must be admitted, and that it greatly improves the condition of the digestive organs is equally certain. — Ed.]

had, nor could be supposed to have, any venereal complaints. She employed herself in coating mirrors with quicksilver, and to that she ascribed her malady. In fact, her system had been long under the influence of mercury, in consequence of her occupation. When I visited her, her daughter and husband, the latter of whom was paralytic, and almost bedridden, were affected, from the same cause, with a pustular eruption of the face, with disease of the nostrils, and snivelling. Another old woman had numerous and deep ulcers of the fauces, tongue, and lips, having been kept unmercifully under mercury for nine continuous months. She had, besides, taken it from time to time, for upwards of four years, though her sole complaint was slight sore throat. Pains of the joints, too, I believe, are attributable to the use of mercury. That medicine has no power to prevent the occurrence of nodes, for these often form during its action. Affections of the periosteum are very frequent in horses and other lower animals, and also easily excited in some human subjects who have neither had pox nor been put under mercury; but in no instance of venereal disease have I observed serious affections of the bones where mercury had not been given. Even the advocates for mercurialising speak of mercurial nodes. It has been asserted that nodes do not occur when mercury has been given for liver or other complaints; but they do form under such circumstances, though not so frequently as when the medicine has been exhibited during venereal symptoms. A cachectic state is often induced by a continued use of mercurial preparations, or at least by mercury and disease together, in constitutions not originally strong. It is marked by pale lips; bloodless conjunctiva; a rough anserine skin; a relaxed state of the mucous membranes; hemorrhages from these, particularly from the gums, which may prove fatal, as I have myself witnessed; exfoliations of the alveolar processes; slimy stools; pale urine; pains of the limbs; sores, showing great indolence, or even assuming malignant action; dropsical symptoms, and other evils, of which a lengthened catalogue might be made out. Such symptoms were often met with when mercury was exhibited for every trifling or suspected sign of disease arising from carnal conjunction. On this subject, Mr. Samuel Cooper has well remarked: "Experience has fully convinced me, that in no forms of chancre, nor in any other stages of the venereal disease, is it proper to exhibit mercury in the unmerciful quantity, and for the prodigious length of time, which custom, ignorance, and prejudice, used to sanction in former days. Violent salivations ought, at all events, to be for ever exploded. When I was an apprentice at St. Bartholomew's Hospital, most of the venereal patients in that establishment were seen with their ulcerated tongues hanging out of their mouths, their faces prodigiously swelled, and their saliva flowing out in streams. The wards were not sufficiently ventilated, and the stench was so great, that the places well deserved the appellation of *foul.* Yet, notwithstanding mercury was thus *pushed* (as the favourite expression was), it was then common to see many patients suffer the most dreadful mutilations, in consequence of sloughing ulcers of the penis; other patients, whose noses and palates were gone; others who were covered with nodes and dreadful phagedenic sores." This woful picture is not exaggerated, and cannot be too strongly impressed on the minds of young practitioners. A small quantity of mercury will affect violently some constitutions; as of those who have been in warm climates, or who have taken much of the drug, even in this country.

Eczema Rubrum, a disease resulting from external causes, but which may also be produced by mercury, often arises from but a very small quantity of that medicine even applied externally. It most frequently affects the scrotum and upper and inner parts of the thighs. It is preceded by heat and itching in the part; a diffused redness appears, and the affected surface is rendered rough by the eruption of numerous minute vesicles. In a short time, these vesicles, if not ruptured, attain the size of a pin's head, and the included serum becomes opaque and milky. The affection soon extends over the rest of the body in successive large patches, and is accompanied with considerable swelling of the integuments, tenderness of the skin, and itching. The vesicles burst, and discharge a thin acrid fluid, which renders the surrounding surface painful, inflamed, and excoriated. The discharge becomes thicker, adhesive, and fetid, and by its drying, partial yellowish incrustations are formed. The disease terminates in desquamation, and in some cases, the hair and nails are also lost. It is preceded and accompanied with smart fever, and general disorder of the system.

Erethismus is another occasional consequence of mercury, characterised by remarkable depression of strength; small, quick, and often unequal pulse; anxiety, sighing, and trembling; a pale contracted countenance, and occasional vomiting. While in this state, sudden exertions are apt to prove fatal.

OF SCALDS AND BURNS.

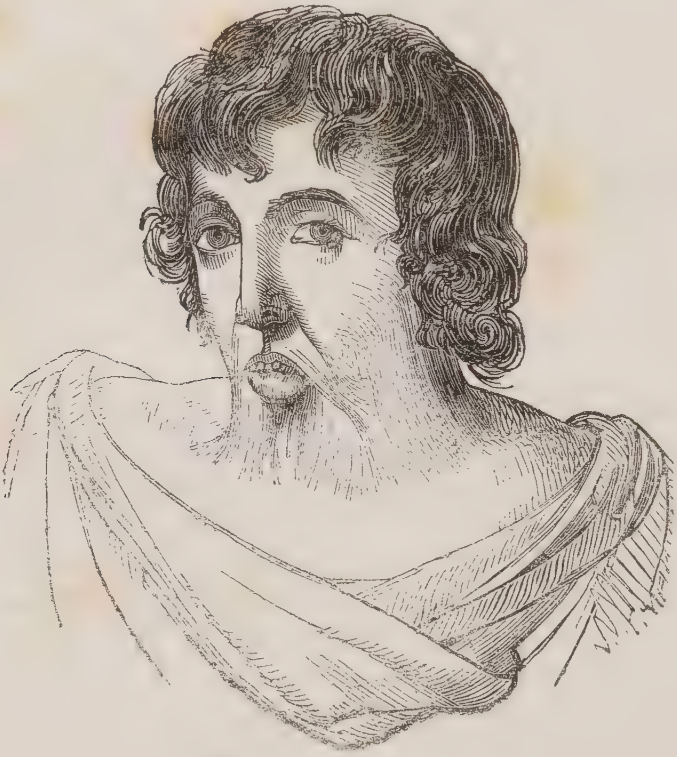
Different degrees of injury are inflicted on the surface from the application of heated solids or fluids. The term scald is generally confined to the effects of heated fluids, whilst burn denotes the consequences of the application of a heated solid, or of ignited combustible matter; the latter class of accidents is, in general, the more serious, yet the former, though not injuring the skin deeply, gives rise to the most alarming symptoms when a large extent of surface is affected. A slight degree of heat is productive only of redness of the surface, with a sharp hot pain, and these symptoms may subside with or without vesication. However, effusion of serum under the cuticle often takes place almost immediately after the contact of the heated body — the cuticle may be destroyed by the intensity of the injury — or the true skin may die, either partially or throughout its whole thickness, and the subjacent parts be at the same time injured to a greater or less depth. But parts, not severely injured at first, may afterwards perish, violent inflammatory action being excited, which terminates in sloughing. The neighbouring parts have their vitality much diminished, by the direct influence of the injury; and hence, when these parts come to be the seat of increased action, sloughing almost inevitably ensues, from the want of corresponding power. From the same cause, subsequent sores are tedious in healing, being so far debilitated as to be unable to assume full vigour; even slight ulcerations following vesication contract very slowly; the granulations are flabby, and the discharge profuse and thin. The inflammation is often at first very violent, and kept within bounds with difficulty. Burns of the trunk, particularly of the genital organs, are to be considered as attended with much danger. And extensive burns and scalds, wherever situated, are always to be dreaded. Violent constitutional irritation takes place, dyspnœa is apt to occur, with effusion into the chest of serum, or a sero-purulent fluid; and the nervous system ultimately becomes oppressed. Great sinking of the vital powers is generally the immediate consequence of extensive and severe burns; there is shivering, weakness of the pulse, cold extremities, anxiety, and vomiting, requiring the exhibition of warm drinks, and even sometimes of cordials, opium, or strong stimulants. These must, however, be given with a sparing hand, or the depression following the excitemen tis with difficulty got over. Nor can it be matter of surprise that such serious effects occur, when we reflect on the extreme sensibility, and highly organised state of the affected part, and the important functions which it is intended to perform, as well as those sympathies which it holds with internal parts, on which life principally depends.

In trifling burns cold applications are generally used — as immersing the part in cold or iced water. A great variety of remedies are employed, spiritous, watery, acid, alkaline, cold or hot; some apply a coat of cotton or flour, some of tar or pitch, and they state that when these artificial crusts separate, the skin is found healed beneath; in fact, every practitioner, and almost every individual, possesses a favourite application for this very common accident. Some have recommended holding the part to the fire, or plunging it into hot liquid; but this practice, and all similar, are too severe ever to become general, when milder means prove equally effectual. Perhaps the most common applications are, a mixture of lime-water and olive oil, or the ceratum acetatis plumbi. The vesicles, when left to themselves, burst, expose an irritable surface, and the acrid discharge from them excoriates the surrounding skin. Their contents ought to be evacuated by a small puncture, and the cuticle being left carefully undisturbed, a scab soon forms, by which the part is protected while healing. In extensive injuries of the skin, where the cuticle has been altogether destroyed, finely carded cotton is sometimes applied; it is of use in somewhat the same way as the cuticle in the former instance, and being a sort of cushion over the part, prevents it from being irritated by bed or body clothes, or by the patient's resting on it. It soon becomes soaked with the discharge, and must either be frequently changed, or become a receptacle for pus to putrefy in, and maggots to breed; on account of these circumstances it is objectionable. Dusting the part with common flour, starch, or hair powder, is equally advantageous, and much more convenient; relief is afforded by its immediate application; the parts are cooled; the flour, absorbing the discharge, is soon formed into crusts, which effectually protect the surface ; and the after-secretion readily escapes from beneath this, no more moisture being imbibed than is merely sufficient for the encrustation. The artificial covering ought not to be removed until completely detached, by purulent matter accumulating beneath it; then its presence can be of no service, and its removal is accomplished by fomentation or poultice, and without pain to the patient; whereas, by pulling off the crusts shortly after their formation, as some do, whilst they are adherent to the surface, and protecting it from injury, much pain is given to the patient, the raw surface is irritated, and made liable to overaction ; a useful application is taken away to make room for another, and, perhaps, not so congenial. After the spontaneous separation, fresh flour may be again sprinkled over the suppurating surface, and, if the affected part is small, it may heal under this application. But when, in burns of considerable extent, suppuration is fully established, and granulations have begun to arise, tepid-water dressing, and lotions, are to be applied as to any other granulating sore; for the reasons already assigned, the applications require to be of a gently stimulating nature.

In severe cases, there is first extreme depression of the powers of life, under which patients sometimes sink ; but most frequently this state is obviated by the employment of cordials or stimulants. But these ought to be administered with caution, for reaction soon commences, and often increases to well-marked inflammation, requiring for counteraction low diet, and even bleeding. In such cases gentle laxatives are preferable to purgatives, as by the latter the patient is obliged to make frequent movements, and those are always painful. Stimulants have been strongly recommended, at first powerful, and afterwards gradually weaker, so as, it was said, to restore the balance between the affected parts and the system ; and the latter is again to be excited, in order to meet the increased action which the parts assume. The practice is founded on fancy, and cannot become general, being in its first part cruel, and in its second absurd. Whilst debility exists, stimulate cautiously ; when overaction ensues, adopt those measures which are best calculated to subdue excitement ; this is common sense, and the common practice.

During the process of healing, position of the parts ought to be carefully attended to ; contraction of the cicatrices, and cohesion of opposed surfaces often causing unseemly deformities. Surfaces opposed to each other, and naturally separate, may be prevented from uniting by dressing interposed ; and contraction of joints is to be guarded against by keeping the limb extended by splints and bandages. Where deformity has occurred, the hardened cicatrix which is in fault may be either divided or excised, and by paying attention to position in the after-treatment, the evil may be greatly lessened. In the case of contracted joints, it is not necessary to excise the whole or greater part of the callous web ; simple division is sufficient, if carried deep enough, through the altered and condensed cutaneous tissue. A horrid case of deformity is sketched on the next page, and from a very horrid and atrocious scoundrel, the companion and assistant of Messrs. Burke, Hare, and Co., the Thugs of the Modern

Athens. In such a deformity the art of surgery could not avail. In others, however, the cicatrix is not so extensive; it is separated into bands, by the division of which the position of the head and lip is improved, and the comfort of the patient much enhanced. In one case, in which I operated with success very lately, the scar, though extensive, was remarkably soft and pliable, as much so as the finest kid leather.



PART SECOND.

OF PARTICULAR SURGICAL SUBJECTS.

INJURIES OF THE HEAD.

Wounds of the Scalp are attended and followed by more dangerous symptoms than wounds of the integuments on any other part of the body. This is in a great measure attributable to the nature and connections of the parts. The subcutaneous fatty matter is condensed, and closely attached to a firm and unyielding tendinous expansion; and betwixt these tissues and the pericranium, a loose cellular tissue is interposed, so as to allow of free motion of the parts. They are highly vascular, with the exception of the occipito-frontalis fascia, and between them and the internal parts, as is well known, a free communication exists. Injuries of these coverings, though at first apparently trifling, and consequently looked upon as of no importance, and unattended with danger, often assume a very alarming character. No injury of the head, in fact, is too slight to be despised, or too severe to be despaired of.

Punctured and lacerated wounds, more especially those penetrating all the layers of covering, are frequently followed by violent and extensive inflammation of all the tissues, with severe constitutional disturbance, and with delirium and other symptoms denoting functional derangement of the brain. The swelling is often extensive, involving the whole scalp, together with the integuments of the face, and completely shutting the eyelids. In some cases resolution may be accomplished, but the most frequent termination is extensive infiltration of purulent matter into the cellular, or even into the more deep structures, with sloughing of the tendinous expansion. Collections of matter frequently form in the loose cellular tissue of the eyelids, when the parts are affected with inflammation, whether superficial or deeply seated.

As to treatment, after the infliction of an injury, the scalp ought to be shaved, and the wound cleansed of coagula and foreign substances. If a large flap of integument is detached, it should be replaced, and retained as nearly as possible in its natural situation; and if, for this latter purpose, slips of uninitiating adhesive plaster and methodical compression prove insufficient, it will be necessary to employ a very few points of interrupted suture: these, however, must be removed at an early period, that is, when either adhesion or suppuration has commenced, and ought, if possible, to be altogether dispensed with, being apt in this situation to produce injurious effects by their irritation. Light dressing is afterwards applied. On the accession of swelling, heat, and pain, the parts are to be well fomented with a hot decoction of chamomile flowers, or hops, and afterwards covered with a warm and soft poultice; and should these symptoms continue, the fomentation ought to be frequently repeated. Fomentation and poultice are also the best applications when a day or two has elapsed between the receipt of the injury and the patient's application for cure. The constitutional symptoms are to be moderated, and may in many instances be averted, by the exhibition of antimonials and purgatives; and by general bloodletting, when demanded and authorised by the symptoms, and the state of the constitution. Punctures or incisions are to be employed according to circumstances, in order to lessen the vascular congestion of the part, and prevent the formation of matter, to evacuate it if already secreted, or to relieve inflammatory tension and promote the formation of pus at the incised parts, where erysipelatous inflammation is threatened, healthy suppuration in such circumstances often appearing to be critical. In many unpromising cases of lacerated scalp, when a great part of the cranium has been exposed, and partially deprived of its periosteum, a rapid cure has taken place without the formation of much matter. The detached scalp, though much torn and bruised, ought not at first to be removed, it being more prudent to leave nature to determine how much must be destroyed. After the sloughs, if any, have separated, and granulation has commenced, the loss of substance is rapidly repaired in this region, more especially when the patient is young and healthy. General or partial support, by bandaging, is required in many cases, as by a handkerchief, split cloths, or a roller applied in various forms.

Wounds of the Temporal Artery are either the result of accident, or made intentionally for the purpose of abstracting blood; and it may be here proper to make a few remarks regarding this latter circumstance. When it is wished to take away blood from the head, no one thinks of opening the trunk of the temporal artery; its anterior branch is generally chosen. By some the vessel is first exposed by means of a scalpel, and then opened with a lancet. But preliminary incisions are altogether unnecessary. The vessel ought not to be cut entirely through, and the incision should extend obliquely across its course; and care is to be taken that the external aperture shall be larger han that in the cellular tissue involving the artery, as thus the blood escapes freely, and no risk is incurred of its becoming infiltrated into the surrounding parts. When the branch is of the ordinary size, a sufficient quantity of blood is readily obtained from it; but if, from its small size, or a faulty form of incision, blood does now flow freely and quickly, a cupping-glass may be applied, and its lower edge slightly raised. This latter precaution is absolutely necessary, for if neglected, little or no blood can escape, the artery being firmly compressed against the cranium by the edge of the exhausted glass. No other mode of cupping ought to be practised on the temples, for the cupping by scarification is here both unwarrantable and unnecessary — unwarrantable, because the cicatrised scarifications leave an unseemly and permanent mark on a prominent part of the countenance, — and unnecessary, since there can be no occasion for six or eight incisions when one is fully sufficient. The bleeding may be readily stopped, after the requisite quantity has flowed, by a small graduated compress placed over the wound, and retained by bandages, which surround the head, and are afterwards twisted and brought under the chin in order to increase the security. If by these means the bleeding is not readily restrained, the vessel may be divided throughout its whole circumference, by entering the lancet at the original wound, and moving its point laterally. Then compression is to be again employed, by the assistance of which the natural processes for closing the divided extremities are speedily accomplished.

When this artery has been injured by external violence, the wound of the integuments is generally large, and the bleeding profuse. In such cases, both ends of the vessel must be pulled out by means of forceps, and tied separately; afterwards the integuments are to be approximated and supported.

Unpleasant consequences sometimes result from the simple operation of opening the temporal artery, and occasionally also from accidental wounds of that vessel. The integuments unite, and may soon heal; but, from the compression not being sufficient, a small quantity of blood is insinuated into the cellular tissue, which becomes condensed for a considerable extent around the wound, and ultimately a sac is formed, which communicates with the ununited opening in the artery, and is consequently filled with sanguineous clots; in short, an aneurismal tumour is formed. For the cure of this untoward occurrence, the artery may be tied between the heart and tumour, as in the case of spontaneous aneurism; but in consequence of the free inosculation which exists between the numerous ramifications of the artery, this measure may not prove successful, and it will be found necessary, either then or afterwards, to secure the vessel beyond the tumour. But there is another mode of procedure. From the tumour being generally small and circumscribed, excision of the whole of it can be effected easily, and so as to leave but a slight scar: this operation is not liable to failure, and is not more severe than the first mentioned. After the removal of the diseased part by elliptical incisions, the two ends of the artery are to be included in separate ligatures, and the edges of the wound kept together.

A more troublesome accident sometimes takes place, — ulceration of, and over, the vessel, with effusion of serous and purulent fluids into the surrounding cellular tissue, often to a great extent. A profuse flow of blood bursts from the ulcerated surface, perhaps twelve, fifteen, or twenty days after the vessel had been opened, and, if active means are not speedily adopted, the hemorrhage by its recurrence may prove very dangerous. In such cases compression is of no avail; the bleeding may be staid for a time by this means, but upon the circulation becoming again active, fresh hemorrhage must and does take place; the parts around are separated and engorged more and more, the blood escapes in alarming quantities, and the patient is saved only by the occurrence of syncope. To search for, and make a clean dissection of the wounded part of the vessel in such cases, is impossible. A long and deep incision must be made through the swollen and diseased parts in the course of the arterial branch, and a ligature passed under it, on each side of the ulcerated point, by means of the common curved suture-needle, or of one in a fixed handle. The ligatures should be at a considerable distance from each other, in order that they may surround healthy parts of the vessel; after they have been firmly tied, all risk of further hemorrhage is gone. Of course the ligatures should enclose as little as possible of the parts surrounding the artery. A poultice is perhaps the best application for a few days, and under its soothing influence the effects of the continued compression, which had been previously employed, soon subside. The after applications must be varied according to the appearances which the part presents.

Laceration of a large or small bloodvessel is a frequent consequence of *bruise* of the scalp. — Blood is effused, and the surrounding parts are thereby separated to a greater or less extent; and thus a tumour is formed, either rapidly or slowly, according to the size of the injured vessel. The swelling is in general large, soft in the centre, and hard towards its circumference; the blood in the latter situation being coagulated, and firmly impacted in the condensed cellular tissue; whilst in the centre it is fluid, or at least partially so, and occupies a free cavity. These characters of the tumour are apt to mislead a careless or inexperienced examiner, the feel being in some degree similar to that attending fracture with depression, but still easily distinguishable from it by attentive and experienced manipulation. By pressing the finger or thumb firmly on the centre of the tumour, the blood is displaced, and the bone felt distinctly. In slight cases of this affection, no treatment is required, as the tumour is of no importance, and soon disappears, by the effused blood being absorbed. When, however, the swelling is accompanied with unpleasant symptoms, cold applications are to be made to the part, and low diet, with occasional purgatives, enjoined. If inflammatory symptoms occur, local abstraction of blood may be necessary, followed by hot fomentations to the part. When the pain has ceased, and the swelling is not speedily removed, absorption is promoted by stimulating applications, such as fomentation with a solution of the muriate of ammonia in a decoction of the anthemis nobilis, in the proportions of ℥ss. to ℔ii.; a spirit lotion containing the tincture of arnica montana, in the proportion of one part to fifteen or twenty of water, will be found a good application in many such cases.

Such tumours may ultimately require to be laid open, in consequence of the blood putrefying and becoming mixed with purulent secretion. Under no other circumstances is incision warrantable, as unhealthy, troublesome, and tedious suppurations are sure to follow.

Of Concussion. — Concussion, in a greater or less degree, attends most injuries of the head. The functions of the brain are either disturbed or suspended; there is loss of sensibility, of volition, and frequently of the power of motion. The confusion of intellect or stunning may disappear in a short time, or may continue, though diminished in intensity, for many days, and even for weeks; it is seldom, however, that the functional disorder exceeds in duration two or three days, and in general it disappears before that length of time has elapsed. The stupor is seldom complete; the patient can perhaps be roused, though with difficulty, so as to answer questions by a hurried monosyllable, or make signs in regard to the seat of pain, or for such things as he may suppose himself to be in need of. At first the circulation is weak; the pulse is fluttering, often intermitting, and scarcely to be felt in the extremities; the countenance is pale, and the surface cold; there is occasional vomiting, a symptom which seldom occurs when compression of the brain exists, and the breathing is difficult, though scarcely ever stertorous. The pupils are generally contracted, but not uniformly so; one pupil may be contracted and the other dilated; at first, they are insensible to light, neither dilating when in darkness, nor contracting further when the light is suddenly increased; not unfrequently a considerable degree of squinting exists. The muscles are neither much relaxed, nor spasmodically contracted. After a time, the circulation is restored, and the heat of the surface returns, with more or less of regained sensibility. The pulse either becomes altogether natural, or else more slow or more rapid than in health. The circulation is then easily excited; by even raising the patient in bed, the pulsations of the carotids are increased, in some cases, by fifteen or twenty beats. Sensibility returns, always very gradually, and in some cases more slowly than in others; frequently the patient becomes quite collected after the lapse of some hours or a few days, but in other instances a degree of mental confusion remains for many weeks; occasionally the intellect continues weak for a lengthened period, and sometimes even for the remainder of life.

When the insensibility has begun to diminish, the patient can be roused with less difficulty; if pinched, he complains of it by uttering some inarticulate sounds, or by attempting to move himself further from the quarter whence he supposes the injury to come; he answers, though with unwillingness, loud questions regarding the pain which he suffers, and points to the part where it is chiefly felt. As the stupor goes off, symptoms of inflammatory action, or a threatening of it in a greater or less degree, manifest themselves. The pulse becomes more rapid and sharp, the skin is hot and dry, the face is flushed, the conjunctiva is redder than usual, and the pupils are often much contracted: the patient is restless, and tosses about in bed; mutters confusedly to himself; often attempts to enact a part in some fanciful scene which he supposes to be passing around him, or talks rapidly and incoherently concerning circumstances which have formerly occurred. His flitting ideas are often of an alarming nature; he endeavours to get out of bed, and struggles violently if opposed. He frequently puts his hand towards his head, and gives other indications of suffering acute pain in that region, much increased by any movement of the part.

Such symptoms are often followed by vomiting and rigors, and too frequently by convulsions, more furious delirium, and coma. On examination after death, an increased vascularity of the cerebral membranes is observed; there is an effusion of gelatinous-looking matter on the surface of the membranes, and in the cellular tissue beneath the arachnoid. In more advanced cases, thin patches of lymph, or more extensive strata of it, cover the arachnoid and the inner surface of the dura mater; a puriform fluid is found effused between these membranes, and sometimes blood and matter are deposited in some part of the cerebral substance; bloody serum is effused into the cavities, and at the base of the brain. The above symptoms and appearances sometimes follow injuries not at first thought severe, but are most frequently the result of such as are attended with læsion of the bone, or of the internal parts.

It is not at all improbable that concussion is produced after a manner somewhat resembling the following. The brain has a natural tendency to remain at rest, but is liable to be brought into a state of commotion by impulses on the cranium being communicated to it. When a slight blow is inflicted on the skull, only a slight commotion of the brain is induced, the cranial contents are, as it were, slightly jumbled, and a temporary and trifling confusion of its functions follows. When, however, the stroke is more severe, the brain is separated from its cranial attachments, both at the point struck and at the part directly opposite, — it is thrown upon itself towards its centre; its substance is thereby condensed, its diameter in the direction of the impulse is diminished, and a separation between the brain and cranium is formed at each extremity of that diameter. By post mortem examinations, it has been ascertained that condensation of the substance of the brain does exist in cases of severe concussion. Such commotion may be sufficient to cause instant extinction of life, or the brain may gradually resume its former condition, or with only such slight incited action as may be required to reunite the dura mater with the inner table of the skull. Extravasation of blood or serum is extremely liable to occur in such cases, the vessels being either compressed, stretched, or otherwise thrown out of their natural relations along with the other cranial contents, reparation can only take place by absorption of the extravasated fluid, and gradual deposition of plastic matter. When extravasation takes place to a greater extent, compression is the consequence, as will be more fully explained further on. Perhaps the brain does not recover itself gradually, but suddenly; the impulse, which was at first directed from the circumference towards the centre, now acting from the centre towards the circumference; and then the propulsions and recoilings may be repeated, though gradually lessening in their intensity, until the effect of the original impulse is lost, and all vibration consequently ceases. But concussion may be caused by an impulse received not immediately on the cranium, but on some other part of the body, as when a person falls from a considerable height and alights on the feet or buttocks; and in such a case also its effects may be indirectly communicated to it through the brain, and may produce equally violent effects, without there ever being any appreciable lesion of the cerebral matter.

The circulation may be merely disturbed, or laceration of the brain may occur with extravasation of blood into its substance. It may present the appearance of having been bruised, or the tear of its substance may be extensive. A multitude of minute vessels may be torn without the substance of the brain being much broken, in which case bloody specks will be observed over a large surface of the interior of the organ. In many fatal cases no change in the state, either of the vessels or of the cerebral substance, is perceptible on minute examinations. The organ in these cases has been merely disturbed and shaken, without visible rupture or hurt having occurred. Again, many patients are supposed to labour under concussion only, in whom fracture of the base of the cranium, or extravasation of blood on the surface, or into the substance of the brain, are discovered after death. It is always difficult to distinguish between the effects of mere concussion and those of compression of the brain by extravasated fluid; for, in the greater number of cases, the symptoms of both affections are blended together. In both there is insensibility from the first; but if an interval of sensibility occur, diagnosis is rendered more easy and certain, it being a fact well verified by experience, that the state of stupor which precedes the return of correct intellectual function is the effect of concussion, and that there is every reason to believe that the insensibility into which the patient subsequently sinks, is caused by compression of the brain; if compression existed from the first, the stupor might not be of longer duration than if it were the effect of concussion, but its stillness would not be interrupted by any restoration of mental exercise, however short. Remarkable effects sometimes result from commotion of the brain; the patient may suffer loss of vision or of hearing, either partial or complete; or partial paralysis may occur; of the muscles, for instance, supplied by the portio dura. In many cases such affections may be supposed to arise from compression of nerves, or other læsion subsequent to and caused by the effects of concussion, and probably connected with fracture of the base of the cranium. Again, it occasionally happens that the senses are rendered more acute than previously, and of this I shall mention an example which came under my own observation. An old nurse sustained fracture of the vertex, with slight depression of the broken part, in consequence of some rubbish having fallen on her from a considerable height. Stupor, along with the other symptoms of concussion, was the immediate effect of the injury, but disappeared in two or three days. Her hearing, which previously to the accident had been long so obtuse as to render it necessary for her to discontinue her employment, became so intensely acute, that the most trifling noise became a source of pain. She gave immediate orders for the clock to be stopped, the ticking of which annoyed her greatly. Her hearing gradually became of the natural intensity, and continued perfect. In this case there can be little doubt that restoration of a sense which had long remained dormant arose entirely from cerebral commotion, for no discharge of blood or other fluid occurred from the ears, by which cerumen accumulated in these organs might have been displaced.

People sometimes forget languages from hurts of the brain, whilst they retain memory in other respects; or, rather, the memory on certain things becomes injured, but remains quite perfect on others.

Treatment.—Whilst the circulation remains depressed after injuries of the head, or of other parts of the body, it is a common practice to abstract blood; but it is one which cannot be too much reprobated, for it is attended with great risk, and can be productive of no benefit; the feeble remains of vital power, whilst struggling as it were against the depressing cause, may by depletion be quickly annihilated, when the vigour which they still retained might have been sufficient, if encouraged and supported, to overcome those effects of external injury which had so far reduced them.

When a patient is seen insensible, it is highly proper and necessary to examine carefully the trunk, head, and limbs, in order to ascertain whether either fractures or displacements have occurred; for it is by no means creditable to the care or science of a surgeon to be made aware of such accidents when the patient regains his senses, after the lapse perhaps of weeks, and when they can be remedied, if at all, with much difficulty.

In the first stage of concussion, as was already observed, the circulation is much weakened, and it is therefore necessary to adopt means for sustaining and strengthening it; and with this view, warmth is to be applied to the surface, more especially to the extremities and epigastrium.

When the powers of life appear to be failing, stimulants must be administered internally. Perhaps the most convenient stimulus is ardent spirit, the only objection to its use being, that when imprudently given in large quantities, its effects, though at first stimulant, become sedative; it ought to be given in small quantities, and at short intervals. Other stimuli, as preparations of ammonia, may be given by the mouth; and much advantage will often be found to follow the employment of a turpentine enema, free motion of the bowels, as well as excitement of the system, being thereby procured.

Stimuli, however, should always be used with much caution and prudence, and never unless fully warranted by the train of symptoms under which the patient is labouring at the time; when the circulation is restored in the limbs, and is becoming throughout steady and more natural, all sources of excitement must be abandoned and carefully avoided, as there is considerable risk of reaction proceeding to too great a height. The patient is to be kept quiet in a darkened room, cold applications made to the head, previously shaved, and free motion of the bowels procured by neutral salts with antimony, or by other purgatives not of an irritating nature, and not given in such doses as to prove violently cathartic. Enemata are in some cases preferable, and are always a valuable adjunct, to the employment of purgatives by the mouth; they procure evacuation from the larger intestines, in which feculent matter chiefly accumulates; they ought to contain asafœtida and turpentine; with these additions more salutary effects are produced than from mere evacuants. The latter ingredient would seem, by its local stimulus, to impart energy to the bowels sufficient for the correct performances of their functions, while the former tends to allay spasm and irritation, both locally and generally.

If the circulation becomes unduly excited, abstraction of blood from the system, in sufficient quantities and at proper intervals, is absolutely necessary; and the depletion must be regulated by the symptoms and circumstances of each case. The action will in general be more speedily and effectually moderated by one copious bleeding at the commencement, than by repeated bleedings to a less extent. An easy and open state of the bowels is of much importance in the excited stage. Mercurial preparations are sometimes useful, as they are known to possess the power of causing the absorption of coagulated lymph and serum, and probably of preventing their effusion.

In cases where insensibility continues after the arterial excitement has been subdued, counter-irritation on the head or the back of the neck is often useful, as the application of blisters, or the rubbing in of antimonial ointment. These are supposed to act by causing an unusual influx of blood to the surface, producing a change in that fluid by the copious purulent, serous, and lymphatic secretions from the irritated part, and thereby diminishing the distended and engorged state of the internal vessels, which might produce considerable compression of the brain.

If, at a late period in the case, the powers of life begin to flag, stimulants must be again had recourse to, and may now be pushed pretty freely, there being less risk of inordinate action ensuing, and much reason to fear that life can be prolonged only by the continued use of powerful means for the excitement of the system. Nor ought the surgeon to cease stimulating though the vital powers continue to diminish in spite of the treatment, and though the circumstances of the case may be so hopeless as to lead him to suppose that death cannot be further delayed; for many patients, who would otherwise have necessarily perished, have, by the continued use of stimuli, recovered under my care their sensibility, and been ultimately restored to health.

Separation of the dura mater from the cranium, with more or less extravasation of blood between, sometimes takes place as a consequence of blows on the head, even though not severe. The blood may be absorbed, or an unhealthy abscess may form between the bone and membrane, attended with violent, dangerous, and, if neglected, fatal results. The internal mischief is not without external marks of its occurrence. If the scalp is undivided, a puffy tumour forms; and, when it has been injured, the wound degenerates, its surface is pale, and the discharge gleety; the exposed bone appears white and dry. It is also preceded by general disorder of the system, by restlessness and fever; there is sickness, occasional vomiting, shivering, pain of the forehead and back of the neck; in some cases, delirium and convulsions, and perhaps partial paralysis, and ultimately coma. All these symptoms, however, may exist without indicating precisely either the existence or the site of abscess, as I experienced in the following cases.

A middle-aged man was brought intoxicated into the Royal Infirmary with a lacerated wound of the scalp, over the upper part of the occipital bone, on the *right* side of the mesial line. For thirteen days after the accident he did well, walking about the wards in good health, with the wound healing kindly; but on the fourteenth he became affected with hot skin, restlessness, slight incoherency, severe pain in the head, and intolerance of light, with a full but not quick pulse. A vein was opened, but after three ounces of blood had flowed, he was seized with rigors, vomiting, and violent convulsions; and these symptoms again occurred after the application of leeches to the head. Rigors returned at various intervals; stupor supervened and gradually increased. He became delirious on the eighteenth. A considerable part of the bone was exposed and dead, and there was a puffy swelling of the scalp around the wound. On the nineteenth he lay insensible. A portion of the dead bone was removed by the trephine, and the dura mater was found covered with lymph, but no appearance of effused blood or pus could be perceived. He seemed to suffer nothing from the operation, but continued insensible, passing his urine and feces in bed, with dilated pupils, quick breathing, and subsultus tendinum; his pulse, which had previously never been above 80, now rose to 100. He died on the morning after the operation. On dissection, the right hemisphere of the brain was found of the healthy appearance; but four ounces of pus lay over the *left* hemisphere, between the dura mater and arachnoid, which latter membrane was of a granular appearance; there was also a small sloughy spot of the dura mater over the left anterior lobe. — A woman, aged 40, fell down and sustained a wound of the scalp on the upper part of the occipital bone on the left side; she suffered but little from the accident, and continued to live freely and irregularly. Seven days after the injury she was seized with shivering: and on the ninth day she lay comatose, voiding her feces and urine involuntarily. The wound was pale and gleety, and the surrounding scalp puffy; the bone was bare and white; pupils dilated; pulse slow. The trephine was applied, and fluctuation felt beneath the exposed dura mater, which was otherwise unchanged in appearance; the membrane was divided by a trifling crucial incision, but only a small quantity of bloody serum escaped. Shortly after the operation she became quite sensible, but again sunk into a state of stupor, with slightly stertorous breathing and contracted pupils. However, all traces of coma disappeared next day, and she recovered soon and perfectly, apparently without having received either benefit or injury from the operation of trephine.

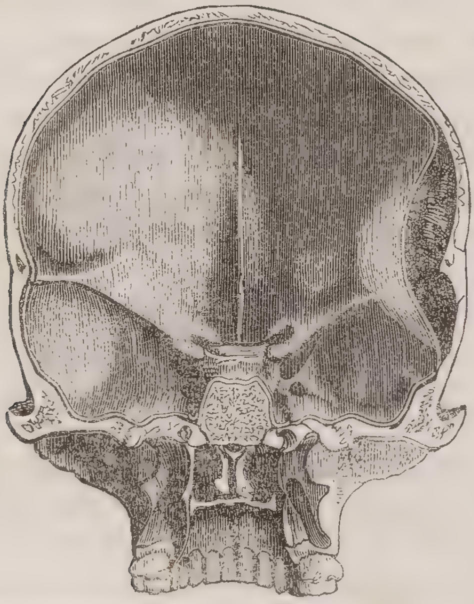
Purulent collections under the cranium, between the bone and dura mater, are not of very frequent occurrence, when symptoms are well watched and treatment properly conducted. But these collections certainly may and do occur, and usually at a considerable period after the accident: many such cases are related by the older authors. Their attendant symptoms are materially different from those of extravasated blood; in the latter case, all the symptoms of compression ensue immediately after the effusion has occurred, and that is generally very shortly after the injury. But matter is not formed till after a considerable period has elapsed; it is not attended with symptoms of compression suddenly supervening, but is preceded by restlessness or febrile excitement; and in the later stages only of the affection do the symptoms of cerebral compression manifest themselves. By the external injury, those bloodvessels by which the dura mater is attached to the skull, and by which it communicates with the pericranium and more external parts, are lacerated, or otherwise materially injured, inflammatory action is excited in the connecting medium, unhealthy suppuration ensues, and by the accumulation of matter, the membrane is completely separated from the cranium, and generally participates in the morbid action. It may ultimately slough and give way, and the matter will then be effused internally. A similar process goes on in regard to the bone and its pericranium, a tumour forms externally, and the bone, being deprived of its supply of blood, necessarily dies, either in part, or throughout its whole thickness. When an external wound exists, the altered appearance of the bone, with the sloughy state of the detached pericranium, gives evident warning of the mischief which is proceeding internally.

The general symptoms of suppuration are the same, whether the collection forms in the substance of the brain, or on its surface. Perhaps the symptoms are not so severe, nor the collection so speedily fatal, when in the substance of the brain, as when situated immediately under the bone, or at the base of the cranium. The external marks already mentioned, are generally indicative of the site of such internal collection, but not uniformly.

Formation of matter in the diploe of the skull, in consequence of external injury, is of rare occurrence; and when it does occur, somewhat similar symptoms and appearances ultimately ensue as when the suppuration commences between the bone and dura mater.

Sometimes the abscess under the bone is of a chronic nature, as in the following case: — The patient, a boy, æt. 11, received a blow on the vertex, after which a puffy tumour formed in the injured scalp, and was freely incised. He afterwards became subject to epileptic fits, which were relieved by copious evacuation of matter from the wound. Exfoliation of the cranium occurred; one small sequestrum was separated, which involved the whole thickness of the bone, and a collection of matter between the dura mater and skull-cap was thereby exposed. The contained matter was evacuated, and the wound was carefully dressed, with the view of procuring adhesion between the membrane and bone, but without effect. The dura mater was ascertained to be extensively detached around the opening; it was found necessary to remove a large portion of bone by means of the trephine and cutting pliers, and then the dura mater soon became united with the integuments of the head. Many months afterwards, the patient complained of severe pain in the back of the neck; an abscess formed in that situation, and, pointing under the right scapula, was opened. Weakness of the right arm and of the inferior extremity suddenly supervened, and the patient gradually sunk. On examination after death, the cervical portion of the spinal chord was found much softened, with infiltration of purulent matter into its substance. The deficiency in the cranium was supplied by a ligamentous expansion, to which the dura mater and scalp adhered intimately.

Of Compression of the Brain.—Compression is produced by extravasation within the cranium of blood or other fluid, by the lodgement of a foreign body on the surface of the brain, or in its substance, or by displacement inwards of portions of the cranial bones; and these causes are usually the effects of external injury. It may either follow the injury instantaneously, or supervene some time thereafter. Many examples have occurred of a patient, at first insensible, with symptoms of concussion, having had the functions of the brain restored almost entirely, and again having relapsed very quickly into a comatose state, in consequence of extravasation of blood. The whole circulation is at first lowered by the shock of the commotion, and the blood scarcely flows in the cerebral vessels; but on its restoration, blood is poured out from the lacerated vessels, or from those which have been so injured in their coats as to be unable to withstand the increasing impulse of their contents. As was already observed, the symptoms of compression are often mixed up with those of commotion, but, when an interval of sensibility has occurred, mistake in diagnosis can scarcely occur. Compression is attended with slow, stertorous breathing; a distinct slow pulse; a relaxed state of the limbs, features, and sphincters; and dilated pupil. Total insensibility to external impressions attends compression of the brain, whatever the cause of it may be. These symptoms may, and do sometimes, gradually disappear after a time. But they may continue unabated, and the patient may gradually sink under them. Or, again, his dissolution may be preceded by excited circulation and furious delirium, the vital powers recovering from their first depression, only to become roused into violent and destructive action, again to sink to a still lower ebb, and be ultimately annihilated. Extravasation is most commonly met with on the lateral parts of the brain in the situation here indicated; the coagulum is perhaps extensive, reaching to the base of the skull, in consequence of rupture of the middle meningeal artery, with or without fracture of the parietal bone.



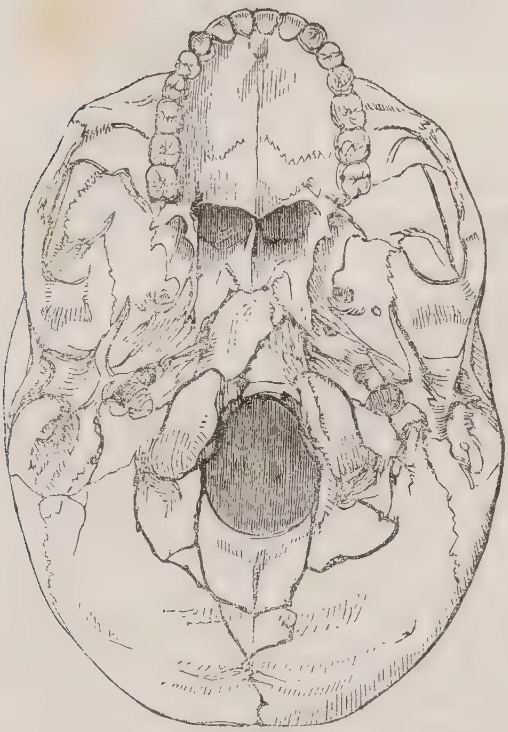
Little or nothing can be done in cases of compressed brain from extravasation. We possess no means of preventing the effusion, and though we did, the mischief has generally taken place before the patient can receive assistance. Again, the site of the extravasation can seldom be ascertained; and, should that objection to the propriety of surgical interference not exist, still the coagulated blood cannot be evacuated even after extensive removal of the bone. If the coagulum is small, it may be gradually and wholly absorbed, or the brain may become accustomed to the pressure of what remains. It is the surgeon's duty to take means for averting inflammatory action, and to subdue or moderate it when it has been excited. The symptoms arising from displaced bone may be relieved by surgical operation; but we must premise some observations on fracture, before speaking of the treatment necessary in such cases.

FRACTURES OF THE CRANIAL BONES.

At an early period of life the bones are soft and elastic; they yield readily under external violence, and it requires a great and direct force to produce fracture of them. Late in life, when the diploe disappears, the external and internal tables come in contact; the bone is brittle, and solution of continuity in it is easily effected. And it is wisely so arranged, for thus in the recklessness of childhood and youth, severe blows on the cranium, which are then of so frequent occurrence, are seldom attended or followed with danger; whilst the aged are taught by experience to avoid the unfortunate consequences so apt to result from even a slight blow on the then brittle cranium, by cautiously preserving themselves from exposure to violence.

Solutions of continuity in the cranium, caused by external force, are either attended with depression or not. Fissures, mere capillary rents in the bone, may take place at the part of the cranium which is struck, or on the side opposite to that to which the force is applied. They will be found either short and limited by sutures, or extending in different directions through several sutures, as from the vertex to the base of the skull, and terminating perhaps in the foramen magnum. Fissures in the upper part of the cranium are of themselves attended with comparatively little danger; they produce of themselves no claim to attention, and really require none. But the force which gave rise to the injury of the bone may have disturbed the internal parts; and though the patient may have recovered from the first shock and the immediate effects of the violence, severe and dangerous consequences often result, and at a late period from the infliction of the injury.

Fractures of the base of the skull are the result of great force applied to the lateral parts of the head, to the vertex, or to the base itself through the spinal column. A blow inflicted by an obtuse body on the top of the head, whilst it is at rest and fixed — by producing expansion of the lateral parietes, and forcing the base down upon the upper part of the spinal column — may have the effect of breaking up the connections of the bones at the base, which is the weakest part of the cranium, and splintering them to a greater or less extent. Again, if a person falls from a height, he perhaps alights on some part of his trunk, as the buttocks, and this coming to a state of rest, whilst the head is still in projectile motion, the spinal column is driven towards the cavity of the cranium, and the same effects are thereby produced as in the preceding instance. Or the patient alights on his head, and the base of the cranium is then impinged upon by



the weight of the whole trunk, as well as by the force of the projecting power, and in this case also the base is frequently broken up. In the sketch here given, showing entensive fracture of the occipital and sphenoid bones into the foramen magnum, the patient, a bricklayer, fell from a ladder on the vertex. He lay comatose for some days before death : there was found extensive extravasation over the middle lobes and cerebellum. Concussion has resulted from falls when the person has alighted on his nates or feet ; but the symptoms attendant on fracture of the base are more generally those of compression of the brain. In this accident the bones are seldom displaced to any great extent ; the dura mater is generally lacerated, its bloodvessels, and frequently its sinuses, are wounded, and blood is consequently effused at the base of the brain, where injury is most fatal. The upper part of the brain may bear pressure to a considerable degree without bad consequences ensuing, but compression at the origins of the nerves is always highly dangerous and generally fatal. Bleeding from the nose, mouth, and ears, when attended with other circumstances and symptoms evincing a violent injury and consequent cerebral disturbance, has been considered as decisive of fracture at the base having occurred. But we find that such bleeding happens in slight injuries unattended with any circumstances or consequences to induce a belief that so serious an injury has taken place : and again, in cases where dissection has shown most extensive fracture in the temporal, sphenoid, and æthmoid bones, no blood had issued from their external openings. Fracture of the base of the skull generally proves fatal, but many cases are met with in which there is reason to believe that it had taken place, and yet the patients have recovered with perhaps partial paralysis. Of this I lately met with a good example in the case of a girl seven years of age, whose head had been squeezed between a wall and the back of a cart, and thereby considerably flattened. She lay insensible for several days, with all the symptoms of compression, and with blood flowing in small quantity from the nose, mouth, and right ear. An extensive abscess formed over the right temporal bone. She ultimately recovered, but remained affected with paralysis of the right side of the face and amaurosis of the left eye ; sensation in the paralysed parts being quite perfect.

Fractures of the upper part of the cranium are generally attended with displacement to a greater or less extent, and with wound of the cranial coverings. The size of the depressed portion, the depth to which it is displaced, and the extent of wound, will depend upon the nature and intensity of the force applied. When both tables are broken, the fracture of the inner is almost always more extensive than that of the outer one, as fissures will extend furthest in the most brittle part. A broken fragment, comprehending the entire thickness of the skull, presents generally a much larger portion of the inner than of the outer table, so much so that the piece would sometimes not admit of removal, though perfectly detached, without enlarging the opening in the outer table. Fractures, with depression of a considerable portion of one of the flat bones, are sometimes unattended with any alarming symptoms. The effects of the injury soon disappear, and even in cases where the depression has been very considerable, and where, from the escape of brain, it was evident that both this organ and its membranes had been seriously injured, no bad symptoms have occurred to retard the patient's recovery. Symptoms of compressed brain, however, may generally be expected to attend depression of any considerable portion of bone below its natural level. Still the brain may become accustomed to the pressure, and the symptoms may gradually subside without surgical interference. And if the indications of compression are not very alarming, the coma not very profound, a little delay is allowable, means being taken to avert inflammatory action: for danger is not imminent, the cure may not be expedited by operative aid, and there is chance of injury resulting from rash interference.

But it is in general necessary to remove the cause of the symptoms, to elevate the depressed bone, and take away those portions which may be detached.

It has been said that we must be regulated in our proceedings very much by the existence or not of external wound; that we must be cautious in cutting down upon fractures of the cranium where there is no wound, and so converting a simple into a compound fracture. In fact, so much is the danger increased, it is alleged, by the existence of wound, that the symptoms must be very urgent indeed which would demand division of the integuments in order to admit of examination of the fracture, the application of the trephine, or the elevation of the bone; whilst, on the contrary, if the fracture is exposed by the accident, very slight symptoms will fully warrant performance of the operation of trephine. In other words, it is said that simple fractures should be left to nature, unless under very urgent and alarming circumstances, and that compound ones ought almost always to be interfered with. But the facts are otherwise. The greatest danger of compound fractures of the cranium does not arise from the admission of air. It is not the wound of the scalp, but the mechanical irritation of the brain and its membranes that proves dangerous. Injuries of the cranium inflicted by sharp bodies, such as divide the scalp and cause compound fractures, are generally attended with splintering of the internal table, and require the trephine. The existence of this sort of fracture of itself, without a single bad symptom, without any present disturbance of the sensorial functions, is a sufficient warrant for the application of the trephine, so as to permit the removal of the detached portions of the inner table: and this should be done before inflammatory symptoms have shown themselves. The brittleness of the internal layer of the skull is well known. In fractures inflicted with sharp and pointed instruments, as a bayonet or pike, the corner of a sharp stone, or the heel of a horse's shoe, the external opening is often very small, it is a mere puncture; in the bone there is a central depression, from which fissures proceed around in a radiated form, and hence the injury has been termed punctured, or starlike fracture. But though the external wound is apparently insignificant, the vitreous table is extensively separated, and, perhaps, broken into innumerable minute and sharp spicula. These sharp portions are driven down upon the dura mater, and by them the membrane is often severely lacerated. If these be not removed soon after the accident, inflammatory action is almost invariably lighted up on the surface of the brain; and we cannot expect to allay or avert such action by general antiphlogistic means, however energetically applied, so long as their exciting cause remains. It is in such cases, I repeat, that the operation of trephining is imperiously called for. Sometimes, however, patients are found to recover from punctured fracture of the cranium, without the operation having been performed, as in the following case, the only one so terminating with which I have met: — On the 4th September, I was consulted by a gentleman, aged 35, who had received a punctured fracture of the cranium, on the 29th of August; a heavy dung fork had fallen from the top of a haystack, and struck him on the upper part of the head. Immediately after the accident he became confused, but not insensible; he lost the power of motion in the right lower extremity, but almost instantly regained it. Next day the right arm became weak, and when I saw him, he was almost wholly unable to move it: he could not bend his fingers, nor raise the arm, and he retained the power of exercising but very slight motion in the elbow-joint. There was a small wound of the scalp, nearly healed, over the posterior part of the left parietal bone, close to the sagittal suture, and nearly midway between its two extremities. A probe passed down to, and through, the bone; and there was slight swelling of the scalp around the wound. He had felt pain in the right ear, and in the forehead, whilst stooping, for some days after the accident. No blood had ever escaped from the ear. A fit of shivering occurred on the night following the injury, but never returned. He soon recovered completely.

I subjoin a case of an opposite description. A coachman was knocked down, late on a Saturday night, and fell with his head on the corner of a stone on which masons had been recently working. After being carried to his lodgings, he recovered from the stupor produced by the combined causes of liquor and blows; and next morning he went to have his head dressed by an apothecary, who with difficulty extracted a fragment of the stone from the wound of the head. The patient then drove a party to church, and probably drank some more whiskey during the day. He afterwards felt indisposed, and was seized with sickness and shivering in the afternoon. On Monday he was in a violent fever, and I saw him in the evening. He had been delirious, but was now lying in a state of stupor. There was a hole in the right parietal bone, capable of admitting the point of the little finger, and many loose fragments of bone were felt lying on the dura mater; a trephine was applied, and numerous spicula were removed. Afterwards, the circulation became much excited, he was bled copiously, and antimony was exhibited in nauseating doses; but he died early on Wednesday morning. On dissection, there were found marks of violent inflammatory action on the surface of the hemispheres. The vessels were unusually numerous and highly engorged, and lymph and pus were effused in considerable quantity, the arachnoid was opaque, and the cerebral substance was somewhat softened. Had the operation been performed at an earlier period, there is every probability that the inflammation, which proved fatal, would have been averted, as in the following instance:—A quarryman received a blow from a sharp stone of considerable size, which rolled down a precipitous bank, and struck him on the vertex. He lay insensible for half an hour, but recovered, and followed his occupation during the rest of the day. In the evening he came for advice. There was a small wound in the scalp, and the subjacent bone was fractured exactly in the same manner as in the former instance, but he felt no uneasy symptoms whatever. The consequences likely to result from such an injury, and the necessity for trephining, were represented to him; he agreed, and the operation was performed on the spot. Many sharp fragments of the inner table were extracted; he proceeded home, never had a bad symptom afterwards, and consequently required no treatment save dressing of the wound.

The operation, if undertaken early, will, in all probability succeed in averting future evil, more especially if the dura mater be not wounded. As a proof of the unfavourable nature of this latter circumstance, I give the following case:—A young man, aged 18, received a kick on the forehead from a horse, September 9th. He remained perfectly sensible, and did not fall to the ground. Shortly after, he was seized with vomiting, which recurred at intervals; his pulse was regular, but feeble; pupils dilated. On the centre of the forehead, there was an irregular wound, which extended to the root of the nose; and on introducing the finger, the os frontis was found fractured, and a small portion of it comminuted and depressed. The trephine was applied, and several detached portions were removed, with some difficulty, from beneath the undepressed portion of the bone. A spiculum had lacerated the dura mater, and penetrated the substance of the brain, to the depth of half an inch; on removing it, a small portion of cerebral matter escaped. The fracture extended apparently in the direction of the right orbit. In the afternoon, the pulse was sixty-four, of good strength, and the pain in the wound had slightly increased. He was bled to fourteen ounces, and ordered an antimonial solution. Afterwards, the pain of the head increased, the pulse rose, the scalp around the wound became the seat of puffy swelling, and several small abscesses formed: the antiphlogistic regimen was rigorously followed, and the abscesses were freely opened as soon as they began to form. On the 21st, a portion of the brain had sloughed, and there was some appearance of fungus cerebri; an incision was made into a swelling over the right temporal muscle, and ℥viii. of blood allowed to flow. On the 22d, several portions of brain were discharged, the pulse was 100, and intermitting. Next day, he was delirious, and a hernia cerebri protruded, of sloughy appearance, and considerable size; pulse 142. Soon afterwards he became comatose; and died early in the morning of the 23d. On dissection, the integuments and pericranium surrounding the aperture, in the frontal bone, were found much thickened, and infiltrated with pus and serum. The dura mater at the wound had a sloughy appearance. There was great effusion of purulent matter, under the dura mater, investing the right hemisphere of the brain; the corresponding tunica arachnoidea was thickened and opaque; and between it and the pia mater there was considerable deposition of lymph and pus. The fungus was collapsed, of a dark colour, soft consistence, and connected with the anterior lobes; the surrounding cerebral matter was much softened, and mixed with pus. The fracture extended through the orbitar plate of the right os frontis, over which lay two small spicula of bone; and a similar fragment was situated over the right optic nerve.

Many cases illustrating the danger of punctured fracture might be related, but are unnecessary, inasmuch as they would lead to the mere repetition of such facts as have been already stated.

Fracture of the external table alone must be rare, but we occasionally see in museums specimens exhibiting a small portion of the outer table driven into the subjacent cancelli, without any fracture of the inner table. This kind of injury belongs entirely to that period of life in which the diploe is of considerable thickness. The treatment would of course be simply that adapted to contusion or concussion.

It is also possible for a blow on the head to produce fracture of the brittle inner table, the outer table remaining entire. However uncommon such a form of injury may be, as its effects may possibly be very serious, it is right to bear it in mind. A splinter of the inner table thus driven into the dura mater might cause violent symptoms and even death.

Wounds of the Brain.—Laceration of this organ to a slight extent, with more or less extravasation of blood, often takes place, without external wound, and when the patient has symptoms of concussion only. In such cases, the blood may be absorbed, and the læsion repaired, without permanent impairment of the sensorial functions. Wounds of it, along with fracture of the skull, are often very extensive; and portions of its substance may be either severely injured, or entirely separated. Loss of substance, even to a considerable extent, in the upper part of the hemispheres, may occur, without bad symptoms or consequences ensuing. The exposed surface of the brain granulates, and is healed as other parts of soft structure. Generally, however, untoward symptoms result sooner or later in such cases. Hemorrhage occurs from the injured part, and a clot protrudes from the external wound. Or the cerebral substance in the neighbourhood of the wound softens, and becomes converted into a semi-fluid mass, often mixed with pus; and a fungous growth, connected with the disorganised matter, gradually protrudes through the aperture in the cranium, and is repressed with difficulty. If removed by knife or ligature, it is rapidly reproduced. Pressure is the only means left by which to attempt its retardation; and this, too, is generally ineffectual; for if not very moderate, the effects of compression extend from the fungus to the whole of the brain, and an impairment of the sensorial functions in a greater or less degree necessarily results. The formation of such a growth is generally attended with shivering, sickness, and fever, by a weak, rapid, and irregular pulse; the strength declines, convulsions and delirium supervene, and coma terminates the symptoms.*

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* [As there are no facts in surgery so valuable as those of a statistical kind, I shall offer no apology for transferring to these pages an abstract of a very able article on *hernia cerebri*, published by Dr. Gurdon Buck in the fourth number of the New-York Journal of Medicine and Surgery. The paper in question is founded on an analysis of thirty-three cases, all collected, save one which occurred in his own practice, from the writings and reports of different American and European surgeons.

Of these cases only two occurred in the female. The age of the youngest was two years and a half; of the oldest, forty; seventeen were twelve years or under; nine from thirteen to twenty years; and seven, twenty-one or upwards. The seat of the wound giving rise to the disease, occupied, in fourteen cases, some part of the frontal region; in seventeen the parietal; and in two the occipital. In fourteen cases the brain was lacerated, and a portion of its substance discharged; in five it was wounded without loss; in one its surface was simply denuded; in ten there was no exposure; and in three its condition is not noticed. The dura mater was torn in twenty-one cases, and in another perforated; the cranium in all, except one, was broken into several fragments; and in twenty-four the scalp was more or less lacerated; in another it was pierced; in three there was no solution of continuity; and in five no mention is made of its condition.

The period of the appearance of the morbid growth from the occurrence of the injury varied in different individuals. In eleven cases it manifested itself prior to the sixth day; in fifteen between the seventh and twelfth; and in five between the twelfth and twenty-fifth. In one instance it did not begin until the eighth week: in another the time is not specified. The earliest period of its appearance was the third day, and that in two cases only; in more than three-fourths it commenced on or before the twelfth day. The average period was the ninth day from the accident.

In regard to the volume of the tumour, it varied from half an inch in diameter to a mass measuring six, by three and a half inches upon the surface, and two and a half in thickness. In twenty-two cases in which the dimensions are stated, the tumour in five was of the size of a hen's egg; in eight it exceeded that magnitude; and in nine it fell short of it. The morbid growth was dissected only in eleven

Perforation of the Cranium is not often resorted to since the treatment of injuries of the head has become better understood. In former times, the operation of trepan was performed frequently,

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of the cases; in nine of these it consisted of cerebral substance, in which the cortical and medullary tissues were distinctly recognised, and in the other two it was composed of coagulated blood of a fibrous texture. In seven cases the tumour assumed a sloughing character; in five it yielded a fetid, sanious discharge; in one it bled freely on the slightest touch; in three it was enveloped by the pia mater; and in three others the surface was coated with a layer of clotted blood. In the centre of the largest tumour a cavity existed, filled with an ounce of limpid serum, and lined by a transparent, glistening membrane.

The general *symptoms*, indicative of disturbance of the vascular system, and of the cerebral functions, may be next considered. In twenty-three cases there was more or less excitement of the heart and arteries; in four none was apparent; and in the other six the symptoms are not stated. "In fourteen cases some one or more of the following symptoms of disturbance of the brain and nervous system were present: coma, delirium, pain in the head, general irritability, and insensibility. In six paralysis of the side of the body opposite to the injury was superadded to the preceding symptoms; and in two convulsions. Three cases were remarkable as presenting some striking exceptions to the general characteristics, and are, therefore, deserving of more particular notice; one of them, from the circumstance that there was no apparent shock to the nervous system, not even as the immediate effect of the injury, though its severity was so great that several fragments of bone and pieces of coal penetrated the brain, causing a discharge of three or four teaspoonsful of its substance. In another the patient remained in a state of complete insensibility and general paralysis for twenty-three days; the hernia appearing on the seventh day, and no inflammatory symptoms supervening. The third case exhibited a character of most frightful violence. Besides paralysis of one side, there were spasmodic actions of the muscles of the face and of all the limbs; nausea, retching, quivering of the eyelids, fixed eyeballs, strabismus, grinding of the teeth, alternate contraction and dilatation of the pupils, intolerance of light and sound, and other signs of the most alarming nervous commotion, often threatening to terminate life."

Of the thirty-three cases in question, seventeen recovered, at a period varying from three weeks to four months; and sixteen terminated fatally, on an average, about the twenty-fourth day. More young persons recovered than old. Of the sixteen fatal cases, eleven were examined, and exhibited the following lesions: in eight the portion of *the brain* subjacent to the hernia was softened, pulpy, more or less disorganised, and sometimes intermixed with clots, while in the account of the other three no notice is taken of its condition. In eight other cases there were signs of acute inflammation of the *arachnoïd membrane*, as indicated by thickening, opacity, ad-

and many seemed to rate the dexterity and science of a surgeon by the number of holes which he was able to bore in the skull of an unfortunate patient. It ought never to be performed, unless the necessity for, and the propriety of, the proceeding be clearly indicated. It used to be practised in a most unlimited manner for fissure: cracks were sought for with the greatest care, rules were propounded to enable the surgeon to distinguish fissures from the cranial sutures, and from furrow made in the bone by periosteal vessels; and the trepan was frequently applied over each part of the fissure, however extensive it might be, the only apparent end of the operation being to widen very materially the solution of continuity in the cranium. It was also resorted to in cases of compression without fracture, with the view of discovering the effused fluid, and removing it; but, as was already stated, it is unwarrantable in such cases; and much more so in concussion, for which latter accident, however, it has been occasionally performed. I met with a case some years since, in which the patient was certainly not much benefited by such active practice. The operation is of itself attended with danger, and likely,

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hesions to the dura mater, and deposits of lymph or pus. The portion of the dura mater around the opening through which the fungous mass protruded was thickened, black, and sloughy, in three of the eleven cases in question. In four the ventricles were filled with bloody serum; in one there was a large abscess in the brain full of pus, and lined with a false membrane. In one case a clot of blood was found between the dura mater and the cranium; in four the fracture extended through the base of the skull; and in one of these the edges of the osseous aperture, through which the hernia protruded, were rounded off by absorption.

In respect to the general *treatment*, it was uniformly antiphlogistic, consisting of the abstraction of blood by venesection and leeching, and the use of purgatives, proportioned to the urgency of the inflammatory symptoms. The local means employed were, excision of the hernial tumour, the application of the ligature, pressure, and caustics, either singly or together. In one of the cases that resulted favourably a spontaneous cure took place after copious hemorrhage from the morbid mass, excited by an accidental attack of vomiting. In another, after the ineffectual use of the nitrate of silver and other escharotics, the ligature was applied and gradually tightened from day to day; in five pressure alone was sufficient; in two the pressure was conjoined with lime-water; and in one with the nitrate of silver. In seven other favourable cases excision was resorted to, either once, or repeatedly, accompanied with pressure; in some dilute nitric acid — twenty drops to the ounce of water — lime-water, or nitrate of silver, were employed in addition. In the sixteen cases that terminated fatally the local treatment was, pressure alone in two; in five excision with pressure; in two the ligature; in one both ligature and excision; and in another escharotics. In five no mention was made of the local means. — Ed.]

under many circumstances, to aggravate the patient's symptoms, and diminish his chance of recovery.

The cranium must be perforated, however, when the existence and site of abscess under the bone is distinctly marked: and in such cases the practitioner is much to blame if he does not give his patient a chance of recovery by the operation: many are lost by its not being performed, and the following case is a striking example of such negligent practice. A young female fell from a great height amongst some rubbish, and sustained a severe blow on the left side of the os frontis, a considerable portion of which was thereby denuded. She seemed to be doing well for some time; but about the eighth day after the accident, pain in the head, with vertigo, rigors, and sickness, febrile excitement, and a white and dry state of the bare portion of the bone, supervened. She was depleted copiously, but notwithstanding all the symptoms indicating formation of matter under the exposed bone were present, the operation of trephine was deemed inadvisable. Severe rigors continued; she became affected with spasmodic twitchings of the muscles of the face, and stiffness of the jaw, neck, back, and breast, and was, in short, allowed to die. On the dissection, the dura mater below the diseased bone was found separated to a very considerable extent, and the cavity was filled with thin purulent matter; the abscess extended along the superior longitudinal sinus, and communicated with this vessel through an ulcerated aperture; the canal was filled with pus, as far as its junction with the transverse sinus, near which point its cavity was obstructed, and the abscess limited by a firm plug of lymph. A small abscess had formed between the bone and pericranium, above the extensive collection within; the internal table of the diseased bone was fractured and slightly depressed, and its fractured edge was rough, sharp, and projecting.

But the operation may sometimes fail to prove beneficial; the brain may have become diseased, as well as its membranes, or the patient may not recover from the irritation caused by the abscess, and the depressing tendency of the antiphlogistic treatment which may have been put in force, previously to the formation of matter. But still there is a probable chance, after the collected matter has been evacuated by the operation, of the dura mater granulating, the cavity filling up, the membrane becoming adherent to the cranium around the aperture, and the patient regaining his former health and vigour.

If, after removing a portion of bone on account of symptoms of suppuration in that situation, the dura mater be found adherent, and of a healthy appearance, the surgeon is scarcely justified in going deeper in search of effused fluid: the evils liable to result from wounds of the dura mater have been already mentioned, and illustrated by an example.

The operation of trephine must also be resorted to in cases of punctured fracture. One perforation will generally be sufficient to enable the surgeon to remove the detached fragments of the inner table.

In fractures with depression, when the brain is oppressed and its functions suspended, means must be taken to elevate the displaced portion or portions to their natural level, and so remove the pressure. For the accomplishment of this purpose, it may or may not be necessary to divide the integuments. If they are entire, which is rarely the case, a crucial incision must be made, or one in the form of the letter T, and the flaps raised so as to show the extent of depression. No portion of the integuments ought to be cut away; the preparatory process of scalping, formerly in use, has been abandoned as cruel and unnecessary. If a wound already exists, but is not sufficiently large, it may be dilated in such a direction as appears most likely to facilitate the after part of the proceedings. The elevation can often be then effected by the judicious application of the lever, its point being carefully placed under the depressed portion, and the sound part of the bone being made the fixed point on which the instrument acts. Those depressed portions which are completely detached, must be removed; but those which adhere, either to the dura mater or to the scalp, ought to be left after having been raised to their former sites, as they will furnish a large contribution towards the filling up of the deficient parietes. Reparation of the skull, when a small portion is removed, or when a single narrow fracture exists, is effected by bone; but when the opening is large, the deficiency is always repaired by a dense ligament, to which the dura mater and integuments adhere. By employing a small saw — represented in both ancient and modern surgical works — so as to widen the fracture, or remove a projecting corner of bone, sufficient room may be obtained for the introduction of the lever and the removal of splinters. In old subjects, the bones are brittle, and a small corner may be readily removed by pliers, or cutting forceps, so as to allow the depression to be raised.

But it may be necessary, in order to elevate portions that are wedged under the sound part of the cranium, to take away a considerable portion of the latter. One or more circular pieces must be removed by the trephine, and it may, perhaps, be necessary to cut out the parts between these apertures by means of the straight-edged saw. The size of the crown of the trephine must be varied according to the object which is in view. The trepan is now disused, and the trephines best suited to the purpose are those fluted on the side of the crown, with the perforator made to slide and fix by means of a proper screw. The centre pin, or perforator, is fixed on a sound and firm part of the bone, and the edge of the crown made to project slightly over the fractured margin. A few turns will suffice to fix the instrument. The saw is then made to turn steadily and lightly, pressure being made when the instrument is moving from left to right, until a pretty deep sulcus is made. The centre pin is then withdrawn, the saw being sufficiently retained by its own groove. The centre pin can scarcely be used at all in children, the cranium being at that age soft and thin. I once had occasion to operate with an old-fashioned trepan, at a distance from town, on a child with abscess under the bone, occasioned by a punctured wound from the point of a spinning top. The centre pin was long, very sharp, and screwed in; and, if it had been used, would have perforated skull, dura mater, and nearly half an inch of the brain, before the saw could come in contact with the bone. I was obliged to use the crown of the trepan, without a centre pin.

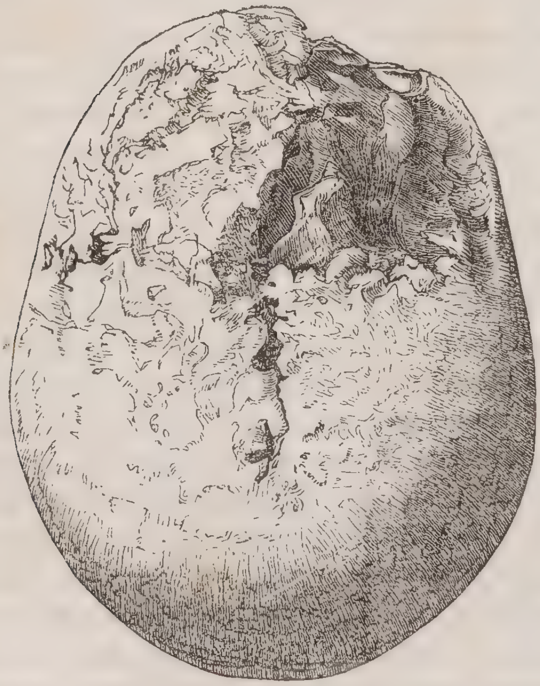
In patients at the middle period of life, a different feeling and sound is communicated to the operator after having cut through the outer table of the skull. Whether this change is experienced or not after getting to some depth, he ought to proceed cautiously, moving the saw lightly, quickly, and sharply, in the direction of the teeth, and using no pressure. The operator should not be hurried, for he is apt to do harm if he is; there is no inducement to make great haste, for the patient does not suffer much, if any pain. After every two or three turns of the saw, it is prudent to examine the track with the flat end of a probe, or with a toothpick. If the perforation is found to be completed at any point, then the instrument is to be inclined to those which are undivided; and the fluted crown allows of this being done with great facility. After the circle of bone is separated on all sides, it is to be removed by forceps, or by means of the lever; and the sharp points ought to be taken from the edge of the perforation by means of the latter instrument, otherwise the dura mater may be fretted and torn when following the natural motions of the brain. The lever must be strong, and simple in its construction. And after a sufficient space of bone has been removed, its point is to be introduced cautiously under the part that requires elevation; the edge of the sound bone at various points affords a fulcrum, and by persevering and steady efforts, the object of the operation will be accomplished. The dressing of the wound should be simple; the integuments are made to cover the aperture, or as much of it as possible, and due support is given by compress and bandage. The after-treatment must be varied, and conducted according to circumstances. It may become necessary to repress the granulations, or else to soothe the wound and abate inflammatory action in the surrounding parts. Perhaps incisions may be required, to prevent the formation of matter, and destruction of the cellular tissue, and of the tendinous expansion, or to evacuate fluid already secreted. The patient's strength may require support. He may stand in need of stimulants; or, on the contrary, the most active means may be required to subdue vascular action, and to prevent the evil consequences which would result to the important parts within the cranium from such over-action.

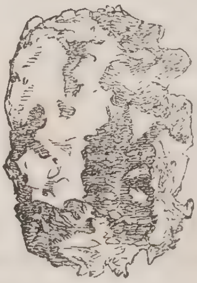
Inflammation of the Scalp occurs either spontaneously, or in consequence of external injury, though slight; and is generally met with in those who have lived freely and irregularly, and are of a bad habit of body. It is more dangerous than inflammation of any other part of the surface, on account of the sympathy and connection which exists between the parts affected and those situated internally: frequently, at an early stage of the affection, delirium occurs, with violent fever. In slight cases, in which the external surface merely is affected, there is little swelling, and but little pain or fever. But when all the pericranial coverings are involved, the symptoms are uniformly severe. The swelling is elevated and puffy, and extends to the eyelids, to the face, and, in some cases, even to the neck: the constitutional symptoms run high, and there is considerable risk of the patient dying comatose. If he recover, and if the disease is little interfered with, but allowed to take its own course, much sero-purulent fluid is infiltrated into the cellular tissue, which generally perishes, along with a greater or less portion of the tendinous expansion lost by sloughing. Often, in neglected cases, a large abscess forms, separating perhaps one-half of the scalp, and bulging over the ear.

The constitutional treatment must vary according to the nature of the symptoms which present themselves; in some cases they show great vascular excitement, and in others they bear unequivocal evidence of general debility from the first. In slight cases of the local affection, it is sufficient to relieve the tension, and abstract blood and effused serum by means of a few punctures, and afterwards to use warm fomentation. More violent cases require free incision in the direction of the fibres of the occipito-frontalis muscle, and thus only can destruction of the parts be averted; the incision must necessarily be deep, for the scalp is often swollen to the thickness of one or more inches. When a depôt of matter has formed, it must be evacuated early, otherwise there is a risk of the bone becoming extensively denuded and exfoliation ensuing.

Chronic thickening of the Scalp is a consequence, by no means unfrequent, of slight injuries in those of strumous habit, but may also occur without any assignable cause. In delicate subjects it is often attended with chronic periostitis of other bones besides those of the cranium. The patient perhaps complains of pains about the shoulders, in the tibiæ, femora, the tuberosities of the ischia, the sternum, the cervical vertebræ, or in the clavicles and ribs. He cannot bear pressure on some points without suffering the most excruciating agony. The pain is also much increased by motion of the parts, as by coughing when the ribs are affected. Such painful affections of parts external to cavities are often mistaken for diseases of the internal organs, and are treated as such by violent bleedings, purgings, and starvation, to the still farther impairment of the patient's constitution. The symptoms are frequently and correctly attributed to exposure to cold and moisture, sleeping in a damp bed, sitting with wet clothes or on the cold ground; but such affections are very apt to occur in those whose constitution has degenerated into that peculiar cachectic state formerly mentioned, after mercurial courses, whether short or severe; or in those who for some real or fancied derangement of the digestive organs have persevered in swallowing, for months or even years, the universal panacea of some practitioners, Plummer's or blue pill. The bones and their coverings, of even the best constituted, can scarcely resist a perseverance in such a course.

The swelling of the scalp is often general, and is slightly œdematous; some points are more elevated than others, feel soft, and are the seat of extreme pain when pressed upon. But such affections frequently flit from one part to another; what was most unsound, at one time, recovering itself, and painful swellings attacking that which was comparatively free of disease. The same holds true in regard to the other bones at the commencement of the affection; but when much change of structure takes place, then the pain and swelling become fixed. The pains are most severe during the night, being then so violent as to deprive the patient of rest, and even prevent him from placing his head on the pillow: they abate towards morning, and remain tolerable during the day. They are always aggravated by change in the atmosphere from dryness to moisture, and the prevalence of easterly winds is peculiarly distressing to patients afflicted with such diseases. The swelling is composed of thickened and vascular periosteum with œdematous integuments. The bone too is often increased in size, and condensed, from continuance of increased vascular action; and its surface is roughened in consequence of its texture being opened out, and new bone having been deposited. Death of portions of the bone often follows, either spontaneously, or after slight bruises received during the continuance of the disease. A few accidental blows on the head, and a perseverance in the use of mercurial alteratives for a series of years, gave rise to the state of matters represented in the accompanying illustrations. The large dead portion represented was removed some months before death. Here the deficiency in the cranial bones is partly owing to ulceration, partly to death of portions of them. The patient's health becomes undermined by want of sleep and continual suffering; and he may at the same time have relaxation of the mucous surfaces, with increased discharge from them, produced by the same cause as occasioned the affection of the coverings of the bones. He may be subject to a relaxed or ulcerated state of the throat, increased or caused by the slightest exposure; and may have hemorrhage from the nostrils, copious expectoration, mucous stools, &c. The periosteal affection alone is a troublesome and serious complaint.





When the pains are fixed and violent, we are sometimes obliged to give small doses of the bichloridum hydrargyri at first, even though there is reason to think that mercurial medicines, perhaps imprudently or carelessly administered, have brought the constitution into its present morbid condition. The good effects of this medicine are well marked and speedy. The patient is freed from the nocturnal pain, gains flesh, and the swellings subside. It ought not to be resorted to, however, unless in severe cases, when the disease cannot otherwise be successfully combated; and when used, it should not be continued longer than is necessary for the removal of the more urgent symptoms: when the pains begin to yield, it is time to discontinue the medicine. Great care is necessary on the part of the patient; he must industriously avoid exposure to moist atmosphere, and ought to be well and warmly clothed, wearing flannel, chamois leather, or both, on the trunk and extremities. A patient treated with the corrosive sublimate of mercury is perhaps more subject to recurrence of the affection, after imprudent exposure, for a considerable time afterwards, than if simple and less powerful means had been employed. A cure can often be effected by the exhibition of the compound decoction of the woods, with or without antimony. Moderate diet and strict abstinence from wine and other internal stimulants should be enjoined; the patient, soon experiencing the good effects of temperance, is exceedingly willing to restrict himself to a somewhat antiphlogistic regimen.

In cases of violent fixed pains, with swelling and threatening of matter forming, incision may be sometimes practised with relief to the patient, but is not to be had recourse to unless there is a risk of the bone suffering. Local abstraction of blood is advantageous, and may, if necessary, be followed by counter-irritation, as the application of blisters or sinapisms. Friction with stimulating substances, or with opiate liniments, is often useful when the disease begins to yield, the pain and puffiness of the parts being thereby dispelled. The hair should be kept short during the cure, and ought not to be allowed to grow till the scalp is firm and sound.

The disease is often so far advanced that, in spite of the most active treatment, abscess forms in one or more points; and, on the matter being evacuated, the bone is found denuded. Exfoliation is then very likely to take place.

Exfoliation generally follows denudation of the bone by accident, but not uniformly. When the periosteum is stripped off by violent injury, the bone in some cases does not lose its natural colour; granulations arise from the exposed part, and it again becomes covered without any part of its substance having been destroyed. Again, careful removal of the periosteal covering, as in excising a tumour or ulcer by the knife, may be followed by death of the outer table of the skull; small portions only separating in some cases, whilst in others a large part of the bone, and of considerable thickness, perishes. The cranial bones may in part become dead throughout their entire thickness, and separate, either after a severe bruise, or in consequence of inflammatory action following injury or arising from disease. The process of separation is either speedy or tedious, according to the vigour of the constitution. The deficiency is repaired, in a great measure, from the subjacent bone, when its whole thickness is not thrown off. But when the breach is complete, the surrounding parts assume the reparative action; the granulations from the dura mater and integuments coalesce, and a dense membrane fills up the space.

The denuded bone should be kept covered and moist, and for this purpose lint frequently wetted with tepid water is the best dressing: spirituous or greasy applications can do no good. A free discharge for the matter should be afforded, and the wound kept clean. If the exfoliation goes on slowly, perforation in the dead bone may be made at different points down to the living parts, with the view of expediting the process. Exfoliations are sometimes retained by surrounding granulations overlapping their edges and confining them in their situation; or are fixed by atmospheric pressure, after separation has taken place from the parts underneath by the action of the absorbents, in the same way as a boy's leathern sucker becomes firmly fastened to the stone to which it is applied. In such circumstances a small screw may be fixed into a perforation carefully made in the bone, and thus the dead part may be lifted out without pain or difficulty, when otherwise it might have lain for many weeks, keeping up the discharge. In this way the large sequestrum, represented at p. 240, was extracted from its bed. The powdered red precipitate of mercury may be occasionally sprinkled on the parts surrounding the dead portion, in order that the granulations embracing it may be destroyed, and the part more completely detached. The general health must be all along carefully attended to. Sarsaparilla with guiac, sassafras, mezereon, &c., is often useful, more especially if pains in other parts continue to annoy the patient. Under such medicines he in general improves very rapidly in appetite, flesh, and strength.

The scalp is sometimes, though rarely, the seat of malignant ulcer. In the early stage the ulceration is not of great extent, and affects only the soft parts; perhaps it is confined at first to the common integument, but is extremely apt to extend to the deeper layers which invest the cranium, and even to the bone itself. It is by no means uncommon to find the cranium very extensively diseased, though the affection originated in the superimposed soft parts. Such ulceration of the bone is of a peculiarly destructive nature; it is a disease of the osseous tissue, corresponding to the most malignant ulceration of the soft parts. The bone around the ulcerated cavity is spongy and soft, its margin is irregular, and bristles with numerous spiculæ; the centre is composed of soft morbid deposit, entangling small portions of bone which have become detached, and flabby, almost lifeless granulations shoot from the distempered mass. Such disease, when the patient does not soon succumb to its virulence, advances to a frightful extent, affecting a large surface, destroying the whole thickness of the bone, and even exposing the internal parts. In a case of this description, which occurred in the Royal Infirmary under my care, the anterior half of the cranium was totally destroyed, the left orbit contained a putrid mass, consisting of the disorganised eye mixed with pus and bloody fluid; the dura mater was exposed, and sloughed at several points, and the unhealthy discharge from the parts lodged on the surface of the brain. In malignant diseases of scalp, as of other parts, the lymphatics become secondarily affected: the absorbents feel hard and thickened, the glands in the neighbourhood enlarge and ulcerate, and the sore thereby formed soon assumes the characters of decided malignancy, — hard everted edges, an angry surface, and fetid thin discharge.

Before the disease has become very extensive in the scalp, and when it is still limited to the superficial parts, it may be removed by the knife; the incisions being made at a considerable distance from the margins of the ulcer, so that those parts which may be supposed to have assumed a disposition to malignant action, may be taken away along with the ulcer. In more advanced cases, it may be necessary that the incisions should extend in depth to the bone; and it may be prudent to insist on a portion of the bone exfoliating, the periosteum being removed, and some potential cautery applied to the exposed surface, — as the alumen ustum, oxydum hydrargyri rubrum, &c. The actual cautery cannot be applied with safety to the cranium. Even where the integuments only are removed, and that to a small extent, and in a proper form, it is vain to think of approximating the parts and procuring union by adhesion; the wound must granulate. There is no difficulty in suppressing hemorrhage; either ligature or temporary pressure may be employed according to circumstances. Mild dressings are to be applied, and proper support afforded. The parts should be kept clean, and for that purpose the surrounding scalp must be shaved repeatedly.

Tumours of the Scalp. — Tumours of a sarcomatous nature are seldom met with in this situation, but the adipose are not so unfrequent. The latter are easily removed, being seldom of large size, and their attachments being loose, unless when they have been irritated by accident or maltreatment. When sarcomatous growths do occur, they are to be excised, with those precautions which were formerly mentioned when treating of tumours generally.

Vascular growths not unfrequently form in the scalp, and attain considerable size; in general they are either congenital, or the degenerations of nævi materni. They may be so extensive as to forbid surgical interference; or they may be so indolent, may partake so much of the nature of simple varix, as not to warrant it. If small, they can be readily removed by the knife, the incisions being made rapidly, and wide of the diseased structure. If the tumour be prominent, extensive, and at all active, the employment of ligature is a more safe and equally effectual practice. One or two ligatures may suffice to encircle the swelling, or, as in other parts of the body, it may be necessary to pass a great many double ones beneath the part, to separate their extremities, and to tie them to each other around the base of the tumour, the last being drawn so as to tighten all the others. Little benefit can be expected from tying, either at once or at different periods, the larger arterial trunks whose ramifications supply the diseased structure, the inosculation amongst the vessels around the tumour being so extremely free. But, in cases where the disease cannot be otherwise combated with any hope of success, ligature of the common carotid, on the affected side, may be tried as a last resource. The practice has proved successful in some cases of this disease, involving parts of the head and face to such an extent, or in such a situation, as to forbid any attempt at removal of the growth.

Encysted tumours frequently form in the scalp, and, if undisturbed, become large; they seldom occur singly. The disease appears in many cases to be hereditary, and it frequently happens that several members of one family are at the same time afflicted with it. The contents of the tumours vary as to consistence, but are generally atheromatous. The cyst is thick, and loosely connected with the surrounding cellular tissue; but as the tumour increases, the adhesions often become firm and intimate, more especially towards the skin. When the tumour is of small size, it is unnecessary to adopt any preparatory measures for its removal, not even to shave the scalp: the surface may be cleared a little with scissors. The swelling is transfixed, in the direction of the fibres of the occipito frontalis, by means of a curved sharp-pointed bistoury, and its internal structure is exposed by the knife being carried outwards. The soft contents are evacuated, and the sac is easily extracted by means of common dissecting forceps. The integuments are then laid down and retained in apposition, no sutures being necessary, and in many cases the wound heals by adhesion; sometimes a small coagulum forms between the edges of the wound, and is detached some days afterwards; then slight suppuration ensues. In larger tumours, however, a straight and narrow knife is perhaps the most convenient instrument for accomplishing removal. The part is transfixed, and in most cases it is necessary to take away an elliptical portion of the integuments, a part of the cyst corresponding to which is of course simultaneously removed; the remainder of the sac is pulled out by the forceps. If the adhesions at certain points are firm, they may be touched with the extremity of the knife, so as to expedite the extraction; and if after the operation there is reason to believe that the whole of the secreting surface has not been taken away, a pointed piece of caustic potass may be applied to the suspected parts. If the tumour is very large, the cyst can often be removed without difficulty unopened, sufficient integument being left to cover the exposed surface. In consequence of such operations on the scalp, erysipelas often supervenes, and precautions ought therefore to be adopted to prevent its occurrence, by a little preparation beforehand, by keeping the patient's bowels freely open, confining him to moderate and mild diet, and avoiding exposure to moist atmosphere and easterly winds.

Osseous tumours of the cranium seldom attain any great size, and are in general neither troublesome nor dangerous. Small ivory exostoses are the tumours most frequently met with in this situation, and require no treatment whatever.

Tumours of malignant character occur, though rarely; commencing either in the diploe of the skull or on the surface of the dura mater, soon enlarging, and involving the parts around. Two or more sometimes form in one patient; they are attended with excruciating pain, and rapid destruction of the bone, and are followed by extinction of life either at an early or remote period. They are entirely beyond the reach of surgery; as are also those tumours, occasionally met with in children, which project through the cranial sutures and contain fluid; such are analogous to the disease named spina bifida, hereafter to be spoken of.

I may here remark, that puncture of the brain, with the view of abstracting fluid in chronic hydrocephalus, is an operation not often likely to be followed by success, and it may even accelerate the fatal issue. Some cases are recorded in which benefit is said to have arisen from the practice. Pressure was applied and kept up after the evacuation of the fluid.

DISEASES OF THE EYE AND ITS APPENDAGES.

Of Inflammation and Abscess of the Lachrymal Passages. — In former times, all affections of the lachrymal passages, and of the parts in the neighbourhood, were denominated fistula lachrymalis, and were all treated nearly in the same manner, by opening the sac, and inserting probes, knives, terebræ, scalpra, caustics, and red-hot irons; the anatomy of the various parts being then ill understood, and the opinions as to the origin and nature of the diseases being founded on erroneous theories regarding the defluxion of acrid humours, formation of imposthumes, fungous growths, &c. The term, however, which was indiscriminately applied to all diseases in the inner corner of the eye, accompanied with derangement of the lachrymal secretion, is now confined to a distinct form of disease, as will afterwards be mentioned.

Inflammation sometimes occurs in the loose cellular tissue covering the lachrymal sac, — whilst that cavity remains free of all disease, — and is attended with some obstructions to the passage of the tears in their natural course, on account of the eyelids becoming swollen, from an extension of the inflammation. The morbid action resembles erysipelas in its nature, and usually terminates in unhealthy suppurations; thin purulent matter lodges in the opened out cellular membrane, a soft boggy tumour is formed, and the superimposed integuments become of a bluish colour, as in the case of other scrofulous collections.

Though the affection is at first unconnected with the lachrymal sac, this organ may ultimately be involved. It may become the seat of a like unhealthy inflammation, and matter may consequently form within its cavity; or, on account of the pressure of interstitial deposit around, the parietes of the sac may ulcerate before the abscess of the cellular tissue in front has discharged externally. Thus, the cavities of the lachrymal sac, and of the external abscess, will communicate with each other. If, after an external aperture has been made either by nature or by art, any doubt exist as to whether the sac is involved or not, such doubt will soon be removed by dexterous use of the probe.

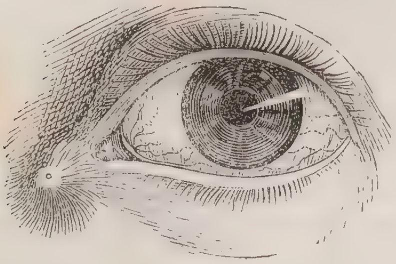
In the treatment of this affection, it will be necessary, at the commencement, as in all other local inflammatory diseases, to attempt the accomplishment of resolution, by attention to the general health, local abstraction of blood, and warm fomentations. When matter has formed, it ought to be evacuated as soon as possible by a small incision, as there will then be less risk of the deeper parts becoming secondarily affected; or if the integuments have sloughed, and the matter has been discharged spontaneously, the natural opening may be enlarged either with the knife, or with the caustic potass. If it be discovered that the lachrymal sac is opened into, the same treatment is necessary as if it remained entire; the matter is to be allowed free exit, and granulation encouraged; in most cases, the aperture in the sac is soon repaired, and the parts heal as quickly and soundly as if the disease had been confined to the external cellular tissue. Light dressing during the cure, preferable in all cases, is more especially necessary in this situation.

Of Inflammation of the Lachrymal Sac.—When the lachrymal sac becomes inflamed, it enlarges considerably; the swelling is small, hard, circumscribed, deeply seated, and extremely painful, more especially on pressure. At first the integuments are of their natural appearance, the increased action being confined to the sac, but they are soon involved, and often to a considerable extent; they become red and swollen, and as the surrounding parts are affected, the swelling increases. In some cases, the eyelids, the caruncle, and the conjunctival covering of the eye, participate in the inflammatory action. The inflammation is in most instances caused, or at least preceded, by some obstruction in the nasal duct, in consequence of which, the tears are interrupted in their natural course downwards, and either accumulate in, and distend the sac, or flow over on the cheek, the puncta lachrymalia remaining open. After increased vascular action has been produced, the lachrymal secretion is increased to a greater or less degree, and much inconvenience is caused to the patient by the profuse discharge following an unnatural course. When inflammation is intense, lymph is effused into the passages, producing obstruction sometimes complete. The mucous lining of the nasal duct becomes swollen, from the vascular excitement, either throughout its whole extent, or at one point only; and in either case the flow of the tears must be interrupted, either partially or wholly, according to the degree of swelling. The vitiated secretion of the part may also contribute towards narrowing the canal, by lodging and concreting there. But a more complete and permanent obstruction is formed by effusion of lymph, under or on the mucous lining, as happens in other canals of similar construction: and in this case also, the stricture may be partial or complete, according to the quantity of effused matter, and the extent of surface affected.

As the inflammation abates, mucous fluid is copiously effused from the surface of the sac, and the swelling increases, though the pain is less. The collected fluid may be partially evacuated through the puncta, either spontaneously, or in consequence of the patient instinctively pressing with his finger on the swollen part; or the puncta may be obstructed by the same causes as the nasal duct, and then the discharge of the fluid is prevented in both directions; it consequently accumulates still more, and causes greater bulging. Fluctuation is perceptible, and the collection protrudes outwards and forwards, being least resisted in these directions. It is seldom that the puncta are obstructed, and consequently the swelling does not attain any great size, the sac being relieved by some of its contents always flowing upwards, after a certain degree of distension. As the inflammation farther subsides, the mucous secretion diminishes, and the accumulation and swelling are less: in fact, the patient may at this period prevent a tumour from forming in the corner of his eye, by from time to time pressing gently on the sac, and forcing the lachrymal secretion upwards, as it begins to accumulate. This state of matters may continue for a long period, without causing much inconvenience, and getting neither better nor worse; the patient is merely obliged to apply his finger and handkerchief more frequently to his eye than would otherwise be required. In almost all cases, the obstruction of the nasal duct is complete, or nearly so, and consequently the fluid cannot pass downwards into the nose, though it may occasionally appear to do so, on account of the discharge from the Schneiderian membrane being increased at the same time with that of the lachrymal sac. The ductus ad narem, though wide in the skeleton, is of very limited dimensions in the living body, and is in consequence readily made impermeable to mucous fluid, by even slight thickening of its lining membrane.

It has been already observed that the above-mentioned condition of the parts may continue for a considerable period; but in other cases purulent matter soon forms within the distended sac; or, at least, the contents of that organ are so altered in colour and consistence as to resemble intimately purulent fluid. The secretion may or may not be pus, probably it is not in some cases; but as the decision of this point is practically unimportant, the description of it as purulent can scarcely be objected to. In most cases, when the puncta either are or become clear, no suppuration, or deterioration of mucus into fluid like pus, occurs; merely chronic distension of the sac continues, the patient being able to avert incited action, by occasionally squeezing out the contents, and thereby removing tension. There is merely an Epiphora; or, as it is otherwise called, Blenorrhœa, or Stillicidium lachrymarum. The last term is by some applied to increased lachrymal secretion, without affection of the sac, the tears being secreted more quickly than the puncta can carry them away, and consequently running over on the cheeks, excoriating the surface, and producing an irritable condition of the eye. The simple epiphora may be of long duration, yet the parts are extremely liable to assume inordinate action, in consequence of slight injury, or exposure to cold; thus suppuration will ensue.

When purulent matter forms, fluctuation becomes more distinct, the pain increases, and there is slight headache and fever. The integuments inflame more and more, and, if the case is neglected, ultimately give way by sloughing. A small ragged opening, often indirect, is formed, and the contents of the sac are not thereby all discharged; the thinner fluid only escaping, whilst the more viscid remains and clogs the aperture. The swelling is not much diminished; the margins of the aperture thicken, become indurated, and contract, the purulent contents of the sac are gradually discharged, and the tears afterwards flow through the opening. The parts are now in that condition to which the term *Fistula lachrymalis* is with propriety applied. The swelling of the canal may gradually subside, the tears resume their wonted course, and the opening may then contract, and the parts cicatrise; but frequently the fistula remains open for a long period, gradually diminishing in diameter, and only a small passage, almost imperceptible, ultimately remaining, through which a few drops of lachrymal fluid are occasionally discharged. Sometimes the fistula closes entirely without the obstruction of the nasal duct having been removed, and the lachrymal sac remains in consequence distended; then the tears or mucus, either clear or turbid, can generally be squeezed through the puncta.



It frequently happens that the meibomian glands are the seat of morbid action, along with the lachrymal passages; their secretion is changed, becoming in some cases thick and caseous, in others puriform. By some, affection of the meibomian glands has been considered as the cause of inflammation and abscess of the lachrymal sac. This opinion, however, cannot be agreed to, for the diseases are not always coexistent; and besides, the affection of the surface of the lachrymal sac and ductus ad narem is as likely to be the consequence of morbid action, extending upwards from the nostrils, as of morbid secretion from the eyelids blocking up and irritating the puncta and the lachrymal passages. Disease of the meibomian glands in the under eyelid often exists along with disease of the lachrymal passages, but the latter is generally the primary affection; the conjunctival covering of the eyelid is at the same time inflamed, swollen, and often granulated.

In some cases of abscess in the lachrymal sac, before the integuments give way, the subjacent bone becomes diseased in consequence of the pressure of the confined matter; portions are affected by necrosis, and after their separation considerable deformity is produced. The exfoliation is often very tedious, and is attended with discharge of fetid thin fluid from the nostril, and from the ill-conditioned lachrymal fistula.

Fistula lachrymalis is often merely one of the symptoms of disease in the bones of the nose, with obstruction of the nasal duct, — as in patients who have suffered from mercury.

Treatment. — In the treatment of epiphora or blenorrhœa — that is, chronic collection of a mucous fluid in the lachrymal sac, with weeping of the eye — a primary object of attention is the state of the general health. The habit of the patient will commonly be found weak, and, if not decidedly strumous, at least inclining towards that diathesis. In such cases the digestive organs must, if possible, be brought into a vigorous state by tonics and nourishing regimen. The local treatment chiefly consists in applying stimulants to the internal surfaces of the palpebræ and lachrymal sac. For this purpose, solutions of stimulating and astringent substances, termed collyria, and various ointments, are employed. At first they ought to be used of rather a mild nature, and their stimulating power must be afterwards increased gradually. The applications are placed between the eyelids, and, becoming mixed with the natural secretion, pervade the diseased surfaces; and, being taken up by the puncta lachrymalia, are afterwards conveyed into the sac. It was formerly the custom to inject the fluids into the sac; but this is unnecessary so long as the puncta and canaliculi remain pervious, and the permeability of these can be readily ascertained by means of a small probe. Permanent pressure on the sac can be productive of no good effect, and is extremely liable to do harm. The repeated application of very small blisters over the sac has been found useful.

Introducing minute gold probes through the puncta has been much recommended, but in the generality of cases can be of little service. The probes are too limber for removing mechanical obstruction, or for affecting in any way the contracted or strictured duct. But passing of the probe may tend to remove the irritability of the passage, as happens in the urethra, and thence some relief may follow. Much dexterity is required in using either the probe or syringe. The puncta are often very small, and it is in general necessary to dilate them by means of the point of a common pin, before any instrument can be passed through them into the sac. The point of the probe being introduced into the punctum, either superior or inferior, must first be carried towards the nose for about 2-10ths of an inch, the instrument being lightly held betwixt the fore and middle fingers of the right hand. It is then directed downwards and backwards. Care must be taken to prevent entanglement in folds of the membrane. Should obstruction be felt, the instrument is withdrawn a little, and then carefully and gently carried in the right direction. The small syringe is managed with one hand, whilst, with the fore-finger of the other, the punctum not occupied by the pipe is compressed.

Neither can much or any benefit be expected to follow attempts to force obstruction in the lachrymal passages, by the weight of a column of mercury. A plan of dilating and rectifying the nasal duct by styles introduced through the puncta has been proposed, but scarcely deserves to be mentioned as a means of cure.

When suppuration is threatened, with increase of the swelling, inability of the patient to empty the sac by pressure, redness of the integuments, &c., an early opening should be made into the tumour, in order to prevent further and more serious mischief. A small opening into the sac cannot be productive of so much injury as forcible dilatation of the canaliculi, followed by and causing ulceration. The point of a straight narrow bistoury is to be entered into the sac, and carried on into the nasal duct, the knife being pushed downwards, backwards, and a little inwards, in the direction of that passage. The point to be punctured can always be readily ascertained by feeling for the firm ligament which attaches the orbicularis palpebrarum to the nasal process of the superior maxillary bone, as the upper orifice of the ductus ad narem is situated immediately below this tendon; by introducing the knife below the ligament, and within the sharp edge of the orbit, and then carrying it forward in the direction already mentioned, the surgeon cannot fail to enter the nasal duct. The knife should be followed by a probe, and ought not to be entirely withdrawn till the probe is fairly lodged in the duct, otherwise the surgeon will experience much difficulty in the after proceedings. If the knife be not pushed into the duct, a blunt instrument can scarcely be introduced afterwards. Some force is required, but is not hurtful, provided it be made in the proper direction, so as to remove the obstruction in the duct without injuring the bones and other parts in the neighbourhood. After the operation, some drops of blood should escape from the corresponding nostril, showing that it has fairly entered this passage; or the patient being made to expire forcibly, the nostrils being at the same time compressed with the fingers, air, blood, and mucus are forced upwards through the opening made.

Many and various modes have been pursued with a view of securing a pervious state of the nasal duct. Instruments of different kinds have been introduced through the puncta, through the opening in the sac, and through the termination of the duct under the spongy bone, and have been retained for a longer or shorter period, according to the fancy, or theory, or plan of the surgeon. The first of the methods of introduction is abandoned, as already stated. By the ancients the passages in fault were got rid of altogether, being either cauterised or destroyed by escharotics.

The passing of probes into the duct from its lower aperture is useful in removing trifling obstructions caused by concretion of deteriorated mucus, or slight thickening of the lining membrane, and in chronic dilatation of the sac with probable contraction of the duct. But, at the same time, it is an operation requiring much dexterity, and which ought not to be attempted till after much practice on the dead body. The first introduction of the instrument is always the most difficult, from obstruction by a valvular projection of the membrane at the lower orifice, the use of which in the healthy state of the parts must be apparent. Destruction of it renders after-introduction of instruments much more easy.

But the preferable practice is making an opening into the sac, and then introducing instruments from the upper orifice of the duct; more especially in cases where the swelling and pain are considerable. The instruments employed for dilatation of the passage are tubes and styles. The tubes are made either of silver or gold, of equal calibre throughout, and of the same length as the passage. For some time after their introduction they cause much irritation; this gradually diminishes, and the wound heals over them. But, according to my experience, the effects are not satisfactory. The irritation which they at first occasion generally subsides, but abscess again occurs, with much swelling, and it becomes necessary to remove the foreign body. Again, the tube sometimes becomes obstructed by thickening and concretion of the discharge, and then, when it is necessary to remove it, the process is found to be by no means an easy one; a free incition is required; a screw must be fastened into the tube, or, when that cannot be accomplished, the foreign body must be laid firmly hold of with strong forceps; altogether the extraction is very painful, and often extremely tedious. In short, the practice of introducing tubes does not appear to be founded on sound surgical principles.

After extensive and impartial trial of both the tubes and style, I decidedly prefer the use of the latter. On the point of the bistoury being fairly lodged in the lachrymal duct, a probe is passed along it; the knife is then withdrawn, and the passage is gently dilated by the probe. The probe again is followed by the style, which should be made of silver, of the same thickness throughout, of the same length as the duct, and with a flattened head placed obliquely to the body of the style. The size of the style should be at first small, and gradually increased. The irritation caused by the first introduction is in many cases very severe, but the parts soon accommodate themselves to the presence of the foreign body; the pain and swelling diminish, as also the discharge. If a large style be pushed forcibly in at first, violent inflammatory action will ensue, and much mischief may be produced. After irritation has gone off, the tears pass readily down in the nose by the sides of the style, according to the laws of capillary attraction, little or no fluid escapes from the external opening, the wound contracts around the instrument, and, its head being covered with black wax, no deformity is produced. The instrument should be removed from time to time, cleaned, and replaced. When, by the continued use of styles gradually increased in size, the duct has been dilated to its full extent, and appears restored to a sound condition, the instrument may be withdrawn, and afterwards introduced only occasionally. The external aperture, which has become fistulous from the long presence of the foreign body, then begins to contract, and, on its completely closing, the tears continue to follow their usual course, and the disease is overcome. But sometimes a small fistulous aperture remains, and there appears to be a disposition towards the renewal of the affection; in such a case, a small style, not exceeding a thin gold probe in diameter, should be introduced every evening, and retained for some hours: this causes little or no inconvenience to the patient, and insures the permeability of the canal.

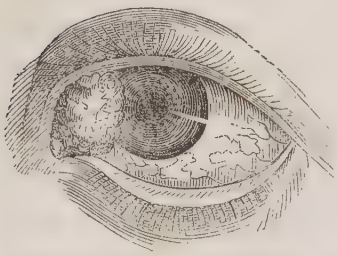
Such is the method by which a permanent cure may often be obtained, and which, in my opinion, is preferable to the use of tubes. If these are to be employed, they should, as already mentioned, be nearly of equal calibre throughout; the external opening must not be allowed to close for a considerable time after the introduction of the instrument; and the tube must be kept pervious for some time by a style introduced through it. But by these means, which are essential for the success of the practice, the main advantage arising from the use of a tube, viz., little irritation being produced at first, and the parts being allowed to close soon over it, are completely done away with.

The practice of perforating the os unguis never can be required; it is cruel, unnecessary, and unsurgical.

Sometimes the lachrymal passages are entirely destroyed. In such cases, it has been found that no great inconvenience arises from their obliteration, as the lachrymal gland ceases, in a great measure, to secrete fluid, and the conjunctival secretion, after having performed its office, evaporates from the surface. In truth, the lachrymal gland always enjoys long periods of repose, and is only called into active exercise of its functions occasionally, as the eye in its ordinary condition is sufficiently lubricated by secretion from its conjunctival covering.

The treatment of fistula lachrymalis, as has been well remarked by an eminent author, must be varied and regulated according to circumstances; — by the degree of obstruction in the duct, by the state of the coverings of the sac, of the sac itself, and of the subjacent bone, and by the general state and habit of the patient.

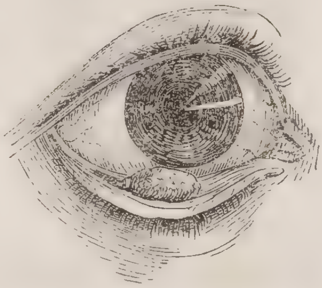
Encanthis is a tumour situated in the corner of the eye. The caruncula lachrymalis appears to be the original seat of the disease, at least it is involved at an early period. The growth is at first small, and appears to be simple enlargement of the caruncle: it is of a reddish colour, and its surface is studded with numerous granulations. It often attains a very considerable size; and, on account of its propinquity to the lachrymal passages, is accompanied with watering of the eye, the puncta being either involved in the growth, or compressed or displaced by it. Sometimes the whole inner corner of the eye, from the margin of the cornea to the inner junction of the eyelids, is occupied by the granulated swelling; and in such cases it is not uncommon for the tumour to extend itself outwards, in the form of a lunated appendage, on the under surface of each lid; thereby the motions and functions of the ball are much impeded, and a prominent deformity is occasioned. In most instances the growth seems to be a simple enlargement of structure, and is of a benign nature; but sometimes it is firm, hard, of rather a livid hue, with a smooth slimy surface, and is decidedly malignant, — enlarging, and gradually involving the surrounding parts.



Cancerous ulceration, attacking and destroying the eyelids, and the parts around the ball of the eye, often commences in the situation of the caruncle, or in a wart on the edge of the lid. Cancer, though a rare and uncommon disease of the eyeball, frequently seizes on the appendages of the eye, extending rapidly in all directions, and often completely detaching the ball by ulceration. Warty tumours also occur on the conjunctiva of the lids, or of the ball, and are inconvenient as a source of much irritation to the neighbouring parts, even though of a benign nature in themselves.

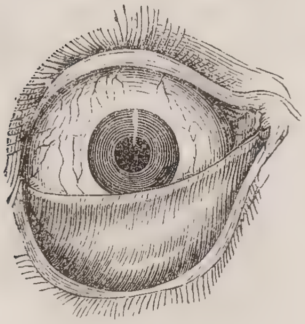
Extirpation, by means of a small pointed knife, or curved scissors, is the only means to be relied on for the cure of such warty tumours, and of encanthis. The growth must be fixed and pulled outwards with a small hook, and carefully dissected away; the eyelids, and, if necessary, the ball of the eye, being kept fixed with the fingers, or by means of a speculum: the fingers are generally sufficient, and more convenient than any instrument. If from the appearance of the parts, and from induration surrounding the tumour, malignant action has evidently taken place or is dreaded, then the incisions must be made wide of the base of the swelling. For malignant, open, and extensive ulcerations, nothing can be done farther than to allay the pain, and soothe the constitutional disturbance. On the whole, encanthis is a rare disease; however, I have seen, and operated on, several instances of it.

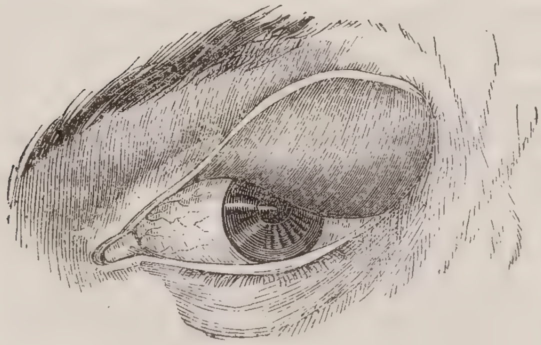
Encysted Tumours of the Eyelids.—These occur beneath the conjunctival lining of either the upper or under lid, but most frequently in the former. They form rapidly, but seldom attain any very considerable size; and may be found to contain, along with glairy fluid, a mixture of pus, or curdy matter. The contents, however, are generally glairy, rarely atheromatous. The cysts are very thin and adherent, and the tumour projects externally, forming a dusky red elevation of the integuments. They cause considerable deformity, watering of the eye, and stiffness and difficulty in moving the lids. On everting the eyelid, the contents of the tumour are seen shining through the distended conjunctiva, and present a bluish appearance. They are seldom single, and are not remediable but by operation. It is improper to attempt their extirpation from without, as there is a certainty of cutting completely through the eyelid, the inner covering of the cyst being merely attenuated conjunctiva. The lid is to be everted, and an incision made into the prominent and thin cyst with the point of a cataract knife; the contents can then be readily scooped out with the end of a probe. It is impossible to dissect out the tender cyst entire, and, when this is attempted, the cure can seldom be permanent. If, after incision and discharge of the contents, nothing farther is done, the disease will almost certainly return, in consequence of the remaining cyst reassuming a secreting action. The only effectual and radical cure is the application of a finely-pointed piece of caustic potass to the interior of the cyst, after discharge of the contents and cessation of bleeding. The cyst is thereby completely destroyed. A slip of soft lint, dipped in oil, is interposed betwixt the lid and eyeball, for an hour or two, in order to protect that delicate organ from the caustic. The wound suppurates and heals kindly, and no mark is visible, the incision having been made from within. I have had no instance of return of the disease since adopting this practice; and I have operated on many which had been previously treated by other and ineffectual means. The laceration of the cyst with a pointed probe is sometimes followed by a permanent cure, but it cannot be depended upon.



Closure of the Eyelids may be either congenital, or a consequence of injuries, as burns of the parts. The closure may be complete or partial. In general it is partial, though perhaps extensive; and the adhesions can be readily separated by the point of a knife, or small probe having been previously introduced beneath; or a small and narrow probe-pointed bistoury may be conveniently used for the purpose. In the after-treatment means must, of course, be taken to prevent the lids from again adhering.

Ectropion, or eversion of the eyelids, may be produced, merely by swelling of the conjunctival lining protruding the lid: or the lid may be relaxed, and the conjunctiva may swell in consequence of repeated inflammation of the parts, caused by frequent and careless exposure; or the disease may be the result of contraction, by cicatrisation of the integuments of the face, as after burns, extensive superficial wounds in the neighbourhood of the eye, or the effect of periosteal disease of the orbit. The affection may exist to a greater or less degree, being in some instances scarcely visible, and not troublesome, whilst in others, the eyelashes lie on the upper part of the cheek, and the swollen granulated conjunctiva is exposed. The lower lid is generally the one which is affected. The disease may exist in both eyes, or only in one. In strumous habits both are frequently affected in a slight degree; and the upper lid, too, is sometimes turned a little outwards. When eversion is of long continuance, and complete or almost so, the conjunctival covering of the ball of the eye, and of the cornea, becomes dry and wrinkled; in short, the membrane completely changes its character, and becomes cuticular. In a lad who laboured eleven years under eversion of the upper and lower lids — arising from abscess and exfoliation of the external angular process of the os frontis, following a blow received when a boy — the conjunctiva was hard, wrinkled, scaly, and exactly similar to cuticle: this change of the membrane also extended over the whole cornea. The surface of the eye had lost its lustre, and vision was much impaired, the patient being able to distinguish only very bright objects. By such cases, continuity of the conjunctiva with the outer layer of the cornea is beautifully demonstrated.





Some of the most intractable of all cases of eversion are the result of burns. The constantly increasing contraction of the cicatrix draws either the upper or the lower lid far from its natural situation, and produces frightful deformity. The tarsal cartilages are greatly extended, and in any operation for the relief of the patient it is necessary to remove a portion before the lid can be properly adapted.

Great inconvenience is caused by the state of eversion: the surface of the eyeball is subject to inflammation, in consequence of being insufficiently protected; the change of its investing membrane is a serious evil; and in some cases the cornea becomes extensively ulcerated, unusually vascular, and opaque.

When the conjunctiva only is in fault, the deformity is slight, and the state of matters is readily ameliorated by excision of the relaxed portion. This is done by sharp curved scissors. As the wound gradually contracts, the eyelid is drawn inwards, and, on cicatrisation taking place, the parts have become restored to their healthy condition. Care, however, should be taken that too much of the swollen conjunctiva is not removed, otherwise the subsequent contraction may cause inversion of the lid. Combined with the above practice, relaxation of the lid itself will in many cases be remedied by removal of a portion of it in the form of the letter V, by means of a sharp-pointed bistoury: the edges of the incisions are afterwards put together by a point of interrupted suture. When eversion arises from a cicatrix of the integuments, the part in fault may be divided; but a temporary benefit only can be procured. For, during the healing of the wound, the parts again contract; and, though a portion of the conjunctiva is at the same time removed, the contraction internally will hardly counteract that which is going on externally. In order fully to obviate the evil of this contraction of the cicatrix in inveterate cases of ectropion, a form of plastic operation may be successfully resorted to. The cicatrix being dissected out, and the tarsal cartilage brought neatly into position, a piece of integument from the temple or cheek may be adapted, and a portion of a new eyelid formed. The parts may sometimes be brought into a good position without the necessity of borrowing any portion of integument. A V-shaped incision can be made, the apex pointing downwards, so as to loosen the under lid; and after it has been drawn upwards and put straight, the edges of the lower part of the exposed space are united by suture.

Entropion, or inversion, consists in the turning in of the tarsal margins of the lids, and generally takes place during inflammation and swelling of the conjunctival lining of the lid. During violent inflammation of the lid the conjunctiva and integuments are much swollen, and bulge out externally; by the projection the margin is forced mechanically towards the ball, and entropion takes place. But in this state of matters, should the lid be by any chance everted, and not replaced, then the bulging is from the conjunctival surface, and prevents the margin from regaining its former site, and permanent eversion or ectropion occurs. In fact, inversion and eversion, like phymosis and paraphymosis, exist from the same parts being put in different relation to each other. More permanent entropion is caused by the contraction which follows removal of tumours from the under surface of the lids, or destruction of large portions of the conjunctiva. The disease is most frequently met with in the upper lid.

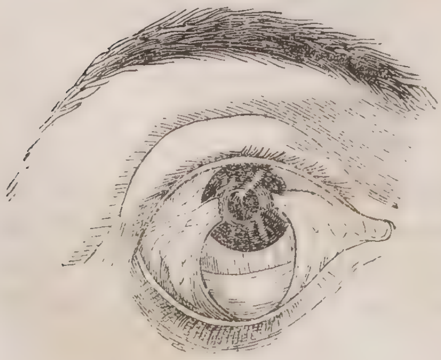
Trichiasis consists in a vicious bend of the eyelashes, or in a supernumerary growth in the rows or numbers of individual cilia, whereby they are inverted, and sweep the surface of the conjunctiva covering the cornea; thus great distress is caused by the friction of the hairs and edge of the lid on the sensible surface of the eyeball, and inflammation is frequently kindled and kept up by the continued irritation; it is accompanied by its usual distressing symptoms when seated in that organ, and too often followed by a greater or less number of untoward consequences. Sometimes only one or two hairs are at fault; in other instances, the half of the eyelash grows inwards; and sometimes there is a double row of cilia; one set being in the usual position, while the other projects against the eyeball. If proper means are not taken to remedy the evil, and moderate the irritation which it produces, the cornea becomes thickened and changed in structure; and vision, at first impaired and indistinct, may be entirely lost.

The symptoms may be for a time palliated by plucking out the faulty hairs, abstracting blood from the loaded vessels, and subsequently using ointments or collyria, — the best of which, perhaps, is the solution of nitrate of silver. In some cases it may be necessary to employ counter-irritation, as blistering the nape of the neck; and in all the general health must be strictly attended to. Other means may be required, and will be mentioned when treating of chronic ophthalmia.

The permanent cure of the disease is effected either by removal or by destruction of the roots of the cilia. The whole edge of the eyelid, or the offending part of it, is removed with a sharp narrow bistoury, the operator steadying the parts by laying hold of the cilia with the fingers of his left hand. It is necessary to remove the mere edge only, the cilia and their roots, and not the whole of the tarsal cartilage, as has been proposed.

Inversion of the lid, from contraction of a cicatrix in the conjunctiva, may be counteracted, by destroying with caustic, or removing with cutting instruments, a portion of the outer integuments, corresponding to the internal cicatrix. Forceps with broad points are used for taking up a fold of the skin, and an oval portion is then excised with a knife or scissors, cutting instruments being less painful and more precise than caustics. Of the latter, the sulphuric acid has been particularly recommended for this purpose. The contraction of the wound releases the cilia from the power of the internal cicatrix, and the parts are restored to their healthy state.

The term *Pterygium* is employed to denote a thickened and vascular state of part of the conjunctiva. The diseased portion is generally of a triangular form, commencing at the inner corner of the eye, extending towards the cornea, gradually diminishing in breadth, and terminating in a sharp apex, either at the margin of the cornea, or somewhere between its margin and centre. The thickening is seldom great, but the vessels which traverse the thickened part are numerous, enlarged, and tortuous — are, in



fact, varicose. The base of the pterygium is always on the circumference of the eye, generally at the inner corner, and its apex is seldom, if ever, situated beyond the centre of the cornea: frequently the sclerotic conjunctiva alone is affected. The motions of the eye are little disturbed by the disease, but vision is materially impaired when a considerable part of the cornea is covered. Pterygium is in general single, but sometimes, though very rarely, there are two or more pterygia in one eye; and, in such cases, the patient's vision is seriously affected, in consequence of the apices of the different pterygia uniting and coalescing on the cornea, and investing the greater part of that organ with a thick and dark shade. When several occur, they sometimes unite throughout their whole extent, and cover the half or more of the eye. This disease is very common amongst negroes and persons residing in equatorial climates.

When the pterygium is of considerable size, extending over the cornea, the only remedy is excision. The apex of the web is laid hold of and pulled outwards by forceps or a hook, and the whole diseased part is then carefully dissected off with scissors, the incisions commencing at the apex, and being carried on to the base. The wound gradually contracts; and though an opaque cicatrix must form on the corneal surface, the speck is of much less dimensions than the space formerly occupied by the pterygium. If the web be thin and not exceedingly vascular, it may be sufficient to make a semicircular section of it transversely, by means of a hook and scissors, between its base and the margin of the cornea; its growth is thereby arrested, and there is a probable chance of its beginning to diminish, and ultimately disappearing. When it is small, and so situated as to cause no impairment of vision, it is prudent and good practice not to interfere with it at all.

Diseases of the Eyeball are numerous, and various in their nature. Some are acute, others chronic; and their attack is either sudden, or slow and insidious. Most of them are attended with pain and other annoying symptoms, and some cause loss of vision. Some are cured by internal means; others require surgical operations; and the cure is either complete and permanent, or palliative and temporary. Some destroy the organ, and others, still more malignant, cause extinction of life. All require much attention and care.

Of Ophthalmia, or Inflammation of the Eye. — The symptoms and appearances of ophthalmia vary much according to the particular texture or textures affected. They require to be minutely attended to, that the treatment may be varied in such a way as to obviate any bad consequences which may be threatened. The great importance of the organ, and the danger to its structure and functions which is likely to occur from any other termination of the affection than resolution, must never be lost sight of.

We shall first treat of inflammation of the more external parts of the ball, an affection generally less dangerous than inflammation of the interior, but at the same time of more frequent occurrence, and produced by slighter causes.

Inflammation of the conjunctiva occurs in many individuals during very warm and sunny weather. At such a period, the eye is often excited by reflection of intense light from the surface of the earth; and is irritated by sudden exposure to a degree of light to which it has not been previously accustomed. Different directions of the sun's rays, and different kinds of light, seem to exert different influences on the organ. The rays are most hurtful when they do not fall in a perpendicular direction on the eye, but slopingly or horizontally. Strong light from the moon, and light reflected from scarlet, are also particularly injurious. Undue exertion of the eye weakens it, and renders it prone to become inflamed. The eyes of infants are often violently inflamed, in consequence of imprudent exposure to light before they have been gradually accustomed to its stimulus. Again, inflammation is caused by imprudent exposure of the eye directly to cold, or by exposure of other parts causing suppression of their discharges, whether natural or not. Inflammation of the conjunctiva often follows suppression, however occasioned, of the menstrual or hemorrhoidal discharges, as also suppression of discharges from the urethra, from the Schneiderian membrane, or from behind the ears. Irritations in the neighbouring parts, as in the mouth during dentition, may also excite the disease. Immediate irritations, however, are the most frequent cause, as the lodgement of extraneous bodies on the surface of the organ — particles of sand, dust, snuff, pepper, or gunpowder, minute insects, loose or inverted eyelashes. By the presence of such substances, the eye is often kept in a very irritated state for a long period. The most violent conjunctival inflammation is sometimes produced by contact of gonorrhœal matter through carelessness. Occasionally metastasis of inflammation takes place from one eye to another; so that a person may be seen one day with severe inflammation of the right, and on the following day with a similar affection of the left, and the right entirely free from disease. Another cause, sometimes met with, of inflammatory action in the conjunctiva, is the lodgement of large foreign bodies in the orbit, with or without destruction of the eye; as splinters of wood, straws, rusty iron nails, sharp portions of stone, &c., penetrating the globe of the eye, or parts in the immediate neighbourhood. Upon removal of the cause, the redness, discharge of tears, pain, &c., sometimes subside without inflammation having been established, the vessels of the part regaining their contractility; but if the cause is continued for any considerable time the effects do not rapidly abate. Wounds and other injuries of the organ are generally followed by inflammation. But a simple clean wound or puncture made with a fine instrument, as in many operations, and in a favourable constitution, frequently produces little or no excitement of the part. The degree of excitement must of course depend upon the nature of the wound, the structure of the parts involved, the lodgement or not of the body by which the wound is inflicted, and many accidental circumstances. The eye may be injured by acids or by lime, and the textures acted upon chemically; again, the membrane may be wounded by pieces of hot metal, and then the destructive action is both chemical and mechanical: in both cases active inflammation of the injured conjunctiva is kindled. The state of the patient's constitution modifies very much inflammatory action of the eye, however induced ; and it has been observed, that dark eyes bear injury or incited action better than those of a light hue. Not unfrequently conjunctivitis is a secondary affection, accompanying eruptile diseases, as measles or small-pox.

In considering the disease, it is necessary to keep in mind the loose connection of the membrane with the subjacent parts, as well as its own texture and functions.

In conjunctival inflammation, the patient first feels a degree of pain and stiffness in moving the organ ; and has always a feeling as if a foreign body were present, whether such is the case or not. There is also a degree of itching with a sensation of fulness in the part, and this is followed by redness of the membrane, becoming more and more intense. If the disease gain ground, the colour changes to a darkish red or purple hue. To the redness succeeds heat, with profuse and hot lachrymation. Then swelling supervenes, often to a great extent : the vessels, both veins and arteries, are much gorged, and effusion of serum or blood takes place into the loose cellular tissue which connects the conjunctiva to the sclerotic.

In some cases, the effusion in this situation is very considerable ; lymph as well as blood is deposited, and a bulging forwards of the conjunctiva is produced ; the stretched membrane becomes thickened, of a raw granulated appearance, and a bright scarlet hue, and the cornea appears sunk in the midst of the swelling, and almost hid by it : this state of matters is termed *Inflammatory Chemosis*, and only occurs when the excitement is very intense.

Blood is frequently effused beneath the conjunctiva in small quantity, in consequence of a bruise or other injury of the eye, — from violent exertion, as during coughing, — or from a less degree of inflammatory action than in the preceding case ; but the swelling thereby occasioned is comparatively trifling, and the effusion is, in general, speedily absorbed. To this affection the term *Ecchymosis* is attached.

In inflammation of the external parts of the eye, the redness begins from the margins of the organ, and gradually diffuses itself towards the cornea. Such is not the case in inflammation more deeply seated. There is intolerance of light in a slight degree, and the patient is inclined to keep the eyelids shut. At first the discharge from the conjunctiva and meibomian glands is increased and changed, and flows occasionally over the cheek, producing a scalding sensation. When the eyelids are at rest, as during the night, they become glued together by the viscid fluid from the meibomian follicles ; but, if the inflammation increases in intensity, the discharge is arrested.

In external inflammation there is more or less constitutional disturbance, proportioned to the violence of the action and the irritability of the system. In most instances the patient complains of headache.

The above symptoms subside along with the inflammation ; but, if this has been at all severe or protracted, distension of the vessels to a considerable degree continues, and the ophthalmia becomes chronic. This change from acute to chronic takes place at various periods of the affection, according to the intensity of the action, the nature of the cause, and the irritability of the constitution. And again, the second stage of ophthalmia may revert to the first, acute inflammation being rekindled by fresh irritation of the organ.

Purulent Ophthalmia most frequently occurs in warm climates, and is attended from the first with profuse puriform discharge from the conjunctiva. In the natural state of the organ, the conjunctival discharge is pellucid, and so small in quantity as to be indiscernible; but in this disease it possesses all the external characters of pus, and is secreted in large quantity. The affection commences generally in the under eyelid, with a feeling as if sand or foreign bodies were lodged in the eye. The parts swell very much, and the eyelids become more or less inverted, in consequence of serous effusion into their cellular texture. Frequently the patient experiences an exacerbation of the complaint about three or four hours after each meal. Though the disease usually commences in the conjunctival lining of the eyelids, the external coverings of the ball are often secondarily affected. In some cases the bulb becomes the seat of lancinating pains; its coats give way; the humours are discharged; and the eye sinks, with immediate relief to the patient from the more urgent symptoms, but at the same time with irreparable loss of vision. In other instances the effects are less injurious to the structure of the organ, but equally so to the sense of vision: the cornea becomes dull, and ultimately opaque, or ulcerates, or partially sloughs; the swollen conjunctival surface of the lids is covered with granulations, and secretes a copious puriform discharge, with or without eversion, according to the degree of swelling. At first the lids are more or less inverted, on account of œdematous swelling of the cellular tissue: in the latter stages they are everted by thickening and turgescence of the conjunctiva. This membrane is at first villous and of a dull red colour, relaxed, and its vessels enlarged and loaded; afterwards it becomes hard, almost warty, and continues to discharge puriform fluid. The latter state of the lining of the lid produces disease of the cornea, opacity of a greenish colour, or an ulcer with intolerance of light, and other symptoms of disorganisation proceeding in that tissue. The disease is supposed to be contagious, and was the scourge of the British army for many years after the campaign in Egypt. In that country it seems to be caused by exposure to cold and damp during the night, and the intense rays of light during the day, more especially when these causes act on eyes which have not been accustomed to such vicissitudes. After its invasion, it is communicable to others by contact of the morbid secretion; and in individuals who have been once affected the disease is very apt to recur when they are crowded together in unhealthy situations.

A disease of equal malignity, and resembling in all respects the Egyptian ophthalmia, occurs from the application of gonorrhœal matter to the conjunctiva, or on sudden suppression of the gonorrhœal discharge, — metastasis of the action sometimes takes place from the urethral membrane to the conjunctiva. The eye is seldom saved from the destructive effects of the violent inflammation which follows the contact of the morbid fluid. Of all forms of purulent ophthalmia, the gonorrhœal is the most rapid in its course and destructive in its effects.

Children are not unfrequently the victims of purulent ophthalmia — the *ophthalmia neonatorum.* Immediately after birth the conjunctival lining of the eyelids seems unusually red and turgid, and a great degree of swelling soon takes place, so as to render separation of the eyelids very difficult. Occasionally eversion of the lids occurs, when the child cries, from sudden and forcible contraction of the strong external fibres of the orbicular muscle. In general, the lids soon relapse into their former situation; but sometimes the eversion remains, if the internally projecting tumour of the conjunctiva is allowed to become still more swelled from strangulation, caused by the outer margin of the reflected lid. The inflammation spreads over the ball; and, in general, the swelling of the conjunctiva, being greatest at the circumference of the eye, bulges out the eyelids, and turns in their margins. Puriform matter is secreted copiously, and is confined, more especially when, from inattention, the margins of the lids are allowed to become glued together. They often adhere so firmly as to require a very considerable force for their separation, and when opened the matter gushes out as if from the cavity of an abscess. From confinement of the matter the inflammation is still more increased, and the cornea involved. Whitish specks form on it, or it ulcerates, and the ulcers make their way into the anterior chamber of the eye; or portions of it slough, causing partial loss of the organ and openings into the chamber, in consequence of which the aqueous humour is discharged, and the cornea sinks and becomes flaccid. In many instances the cornea becomes opaque, changed in texture, and increased in thickness, so as to form a convex projection from betwixt the eyelids, termed *Staphyloma;* the sclerotic coat also is occasionally affected in a similar manner. A frequent cause of purulent ophthalmia in children is imprudent exposure of the eyes to strong light, the parent or nurse not remembering that the organ must be gradually accustomed to the stimulus. Exposure to cold may also induce the inflammatory action. The application of leucorrhœal or gonorrhœal matter to the eyes of the child, whilst passing through the vagina of the mother, is perhaps the most common cause of the disease. A very unhealthy state of the constitution accompanies the affection: the scalp and other parts of the surface are frequently covered with eruptions. A singular result sometimes follows the purulent ophthalmia of infants. A small opaque spot is observed on the capsule of the lens, which remains through life a central spurious capsular cataract.

Inflammation of the Cornea supervenes on simple conjunctival inflammation, and frequently on the purulent. The vessels of the part, both veins and arteries, previously carrying single and therefore invisible blood corpuscules, become much dilated, are filled with numerous globules, and hence are rendered red and conspicuous to the unassisted eye. Writers on ophthalmic surgery, in their rage for refinement, speak of three kinds of this inflammation — inflammation of the external or conjunctival covering, of the middle tunics or cornea propria, and, lastly, of the third coat, the capsule of the aqueous humour: such distinctions, however, are found to effect no good practical end, and it is unnecessary to follow them. One particular layer of the cornea may be first attacked, but the whole structure soon becomes involved. The inflammation generally commences in the conjunctival covering. Vision is necessarily much obscured from even slight inflammatory affection of the cornea. Part only of the organ may be affected, but frequently the whole is involved. Sometimes only one or two vessels remain dilated; but still they, passing over the centre of the cornea, render vision indistinct. Opacity of the cornea, to a greater or less degree, always attends dilatation of its vessels.

In inflammation of the internal and middle tunics of the cornea, most of the enlarged vessels which traverse it are seen to be continuations of those that ramify in the conjunctival covering; while the anastomotic vessels derived from the sclerotic coat are smaller and less apparent than those of the conjunctiva. The cornea, and the sclerotic immediately surrounding it, frequently appear to be almost entirely covered with meshes of their dilated capillaries. At first the whole cornea has a clouded appearance, but as the disease advances portions become distinctly opaque, and at these points either lymph or pus is effused. Sometimes matter collects between the laminæ, distends them, and, causing ulceration, discharges itself either into the anterior chamber or externally. Inflammation of the cornea arises frequently from lodgement of a foreign body in it: and ulcers of it are often produced by a similar cause. If the extraneous matter is not removed soon after its insertion, nature commences her endeavours to detach it, and the process employed is ulceration. Sometimes, however, a sac is formed around the foreign body as in other parts, and no ulcer is produced.

Ulceration of the cornea also takes place in order to afford an exit to matter formed between its layers deeply or superficially. Deep abscess of the cornea is by no means a rare consequence of violent inflammatory action in the part. A minute opaque spot is at first seen; this extends, assumes a yellow colour, and does not change its situation on the head being moved. The internal lamellæ may ulcerate in consequence of the pressure; but this seldom happens; the matter is discharged externally. Suppuration in this situation is often attended with much pain. Abscess of the surface of the cornea is of more frequent occurrence than one more deeply seated: from its external covering yielding readily to the pressure of the accumulating matter, it generally assumes a pustular form. The fluid in such cases is sometimes absorbed, and no vestige of disease remains in the part; but more frequently the apex of the pustule gives way, and an ulcer is the consequence. A similar result takes place if an artificial opening is made for evacuation of the matter; and it may be considered as a good rule in practice not to interfere with collections in the cornea, as there is a probable chance of the matter being absorbed, and the cornea regaining its transparency; while it is certain that breach of its surface, in such cases, though made by the most delicate instrument, will give rise to ulceration.

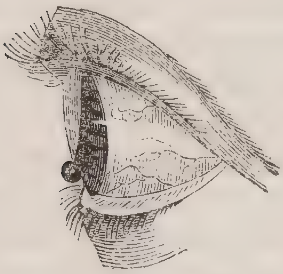
Pustular Opthalmia is at some seasons frequently met with: small pustules, sometimes numerous, form on the conjunctiva, whilst that membrane is turgid and its vessels dilated; the sclerotic conjunctiva around the cornea is their most common situation, but sometimes almost the whole conjunctival surface appears studded with them. When the cornea is affected, the pustules frequently give way, and produce ulceration; and when the pustules are numerous, and surrounded by much vascularity, the part becomes opaque as well as ulcerated.

In weak constitutions *Ulcers of the Cornea* occur from slight causes, — exposure to strong light, intemperance, inverted or irregular ciliæ, a granulated state of the lining of the lids, or from momentary irritation of the part by extraneous matter. The ulcer appears at first circular, but during its progress it often becomes of an irregular form; its surface is depressed and ragged, and can readily be seen by directing the patient to fix the eye, and then looking at the part from one side. The edges are elevated; and the surface, which is of an ash colour, discharges an acrid colourless fluid, as in similar affections of all surfaces that are covered with a delicate, tense, and exquisitely sensible expansion. Sometimes the ulcer is very minute and superficial, and enlarges very slowly, if at all; but in other instances it extends rapidly in depth and size, with great pain and irritability of the organ, and intolerance of light. Occasionally their increase is expedited by partial sloughing. At first, when the ulcer is minute, the part often retains its natural transparency. But as the disease advances, when the sore spreads superficially either by the sloughing or the ulcerative process, or by both, the cornea becomes opaque, often to a considerable extent, around the ulcerated part; and if the ulcer extends deeply, so as to perforate the tunics, the aqueous humour escapes, the iris falls forward, and the pupil becomes distorted: in either case vision is impaired or destroyed. In some cases great relief follows discharge of the humour, and the consequent flaccidity of the cornea, the ulcers seeming to have been prolonged and irritated by the fulness of the chamber. Sometimes an ulcer will penetrate the laminæ of the cornea, even to the aqueous membrane. This latter tissue may resist the ulcerative process, and will then be pushed forward into the opening by the pressure of the aqueous fluid. This is *the hernia of the aqueous membrane,* so called, instances of which have been known to acquire a considerable size before the bag has given way.

Abrasion of the conjunctival covering of the cornea is produced by accident, or follows incited action of the vessels. The abraded surface either ulcerates, or contracts and heals kindly, with or without opacity of the part. Breach of surface in the cornea, — whether an ulcer, an abrasion, or a raw surface, caused by the giving way of a pustule, or of a small abscess, — is constantly liable to irritation, on account of not being protected by mucous membrane and mucous discharge: even the contact of the tears irritates, and keeps up inflammatory action in the membranes. When the ulcerative process ceases, lymph is effused, and a grayish halo forms around the sore; the ash colour of the surface of the sore disappears, and is succeeded by florid granulations, extremely minute, which fill up the cavity;

cicatrisation follows in due time, with subsidence of all the symptoms and appearances of inflammation. There remains, however, an opaque speck of a pearly hue corresponding to the sore, but occupying rather less space. When the cornea is perforated by ulceration, the sore sometimes shows no disposition to heal, becoming a fistulous aperture through which the aqueous humour is from time to time discharged. By this condition of parts vision is much impaired, the cornea being always more or less flaccid. Touching the fistulous opening with the nitrate of silver, reduced by scraping to a very fine point, will often promote a healthy action in the tissue, and effect adhesion of its sides.

The pearly speck which remains after cicatrisation of a corneal sore is termed *Leucoma,* and is permanent. It is generally of an uniform colour, but occasionally a black speck is perceptible in some part of it. For, when an ulcer lays open the anterior chamber, part or the whole ofthe aqueous humour is evacuated, and the iris falls forward; a portion of the iris falling into the opening, provided this is not in the centre of the cornea, closes it up, and becomes adherent to that part. If the opening is large, the prolapsus of the iris is considerable; and in some cases this membrane, being pressed on by the humours, is forced through the opening in the form of a small bag. This change of position is termed *Hernia of the Iris ;* and the dark sacculated portion of the iris which projects from the surface of the cornea is called *Myocephalon*, from its resemblance to the head of a fly. The myocephalon may remain for a considerable time, or may sphacelate and drop away. The pupil is thus rendered irregular, is perhaps nearly obliterated, or is drawn down behind the opaque part, and thereby rendered totally useless to the patient. The impairment of vision caused by Leucoma depends on the size and situation of the speck. The disease is irremediable, though the thin cloudy opacity, which frequently surrounds the leucoma, may be dissipated. The operation of artificial pupil is sometimes required, in order to afford a degree of vision in this affection of the cornea, — as well as in the speck of a similar appearance occasioned by effusion and organisation of lymph betwixt the deep lamellæ of the cornea, and which is termed *Albugo.*



Albugo occurs during the intensity of inflammatory attacks. It also is surrounded occasionally by thinner opacity, but not depressed and unequal on the surface, as leucoma sometimes is. Large and tortuous vessels are generally seen passing into albugines, but meshes of dilated vessels are seldom present. When the affection is recent, it sometimes disappears under proper treatment, especially in young subjects; but the albugo is by no means so readily removed as the *Nebula*, or thin cloudy opacity which is the frequent consequence of obstinate chronic dilatation of the conjunctival vessels. Nebula is superficial, and consists of mere thickening of the conjunctival covering, from lymph having been effused. It impairs vision, but does not destroy it, for the affected part remains semitransparent.

In strumous constitutions specks of the cornea are often accompanied with ulceration of the edges of the palpebræ, and destruction of the ciliæ — *the ophthalmia tarsi.* The margins of the eyelids are red and slightly tumid, and discharge an acrid fluid; the ciliæ are matted together; pustules form at their roots; the bags which secrete them are laid open and destroyed, and they consequently fall out. The affection is often of long duration, and may be in part prolonged by vitiated secretion from the meibomian glands. During its progress it excites very considerable irritation in the whole eye, and, as has been already stated, opacities of the cornea not unfrequently accompany it. Veins become enlarged, and varicose on the conjunctiva, as also their minute ramifications on the clear part of the ball; small reddish lines appear on the cornea, and around them is "diffused a thin, milky, or albuminous humour," which destroys its transparency at that part. Such spots may be solitary or numerous, and darken the cornea either partially or entirely. They are always surrounded with a fasciculus of enlarged veins.

In elderly people a dim opaque ring, of a greyish colour, sometimes encircles the margins of the cornea, and is called *Arcus Senilis;* but this can scarcely be looked upon as a disease.

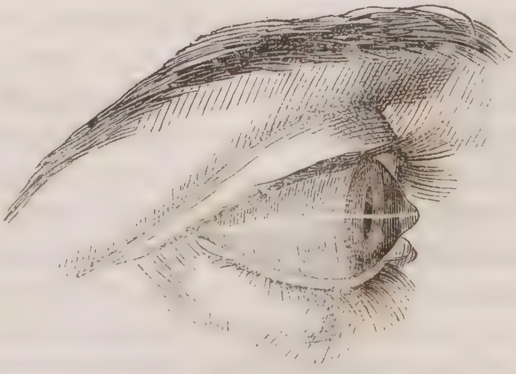
Sometimes the cornea presents a *spotted* appearance; and this state of the organ is generally attended by obstinate inflammatory action in the part. The affection, however, is rare. I have seen several instances of it: in one, both corneæ were spotted, and sight was almost destroyed, without much irritability of the organ. The disease yielded to external stimulants, and the internal use of the bichloride of mercury. It is met with in a chronic and very intractable form.

The cornea may sometimes be rendered dim by *over-distension,* the aqueous humour being unusually copious.

Occasionally *sloughing* takes place in the cornea from over-action. It is dangerous to the structure and functions of the organ, according to the extent to which it occurs.

Ossification of the cornea is said to take place; but few cases are on record, and these were in very old people.

The cornea sometimes becomes *conical* to a great degree in persons considerably advanced in life. The cone has its apex in the centre of the organ, seems thick and crystalline when viewed laterally, and when looked on from the front has a sparkling appearance. In some cases it is opaque in the centre, and occasionally its surface is irregular. Vision of objects at any distance is very indistinct; those placed within an inch or two of the eye are most distinctly seen, especially if looked on through a small aperture. The disease usually affects both eyes, though not always in an equal degree. The patients cannot judge accurately of distance, and see objects multiplied and disfigured.



Staphyloma has been already alluded to as an occasional consequence of purulent ophthalmia in children. The cornea is thickened, prominent, and opaque; and in most cases vision is either much impaired or entirely lost. The prominence varies in different cases, being sometimes very little elevated beyond the natural state of the part, while in other instances it protrudes from between the eyelids. After having attained a certain size it often becomes stationary; but very frequently it continues to enlarge gradually. When the prominence is large, much inconvenience arises from the eyelids not being allowed to close; and the eye, being thereby deprived of its natural covering, is extremely liable to become inflamed from external irritation. When one eye is affected with staphyloma, the other not unfrequently becomes similarly diseased.

Dropsy of the anterior chamber, or *Hydrophthalmia,* occasionally takes place in persons of weak constitutions. The aqueous humour is either secreted in greater abundance than it usually is, or absorption is diminished. The cornea gradually accommodates itself to the increase of the fluid behind, and becomes wider and more prominent, but retains its transparency; in looking at the eye, the anterior chamber is seen evidently enlarged, and occasionally the aqueous humour is of a turbid appearance. There is little or no pain in the eyeball, but the patient complains of an annoying sense of fulness and tension in the part. In consequence of the vitreous humour also accumulating, the whole organ is ultimately enlarged considerably, and its motions are thereby much impeded. At first, vision of near objects is impaired, whilst the patient sees very distinctly those placed at a distance; ultimately sight is entirely lost.

Exophthalmia, or protrusion of the eye, attends the preceding disease, and is also a consequence of various other morbid actions in the globe and its neighbourhood, especially from the pressure of tumours in the orbit. The chronic enlargement of the bulb is noticed more fully in the succeeding chapters.

Treatment of External Ophthalmia, and its Consequences.—The exciting cause, if such exist and can be discovered, ought in the first place to be removed. The surface of the organ and of the palpebræ should be carefully examined, either with the naked eye or with a magnifying glass, in order to detect any small extraneous body which may be lodged in the part. In examining the inner surfaces of the palpebræ, it is necessary, to produce complete eversion, to bring the parts completely into view; and the most convenient method of accomplishing this is to lay hold of the ciliæ between the finger and thumb, and reflect the lid over a silver probe placed along its base. This can, by a little practice, be accomplished readily without using a probe, and even by the fingers of one hand only. This is the more necessary, as small particles of foreign matter lodge more frequently on the palpebral conjunctiva than on any other part. If a particle of glass, metal, stone, &c., be discovered, it should be gently removed by the flattened extremity of a silver probe, or by a scoop, a fine needle, or a delicate brush. In some cases washing the surface by means of a small syringe, filled with a bland fluid, is extremely useful; as when an impalpable powder has been thrown into the eye, and can with difficulty be removed, in consequence of spasmodic contraction of the eyelids preventing exposure of the parts. The application of an emollient poultice, with the addition of hyoscyamus, is beneficial when it has been found impossible to remove the whole of a fine powder. When particles of lunar caustic have, by accident, come in contact with the eye, they are to be removed, as soon after insertion as possible, by a fine hair pencil dipped in oil or fresh butter, — not in water. Small loose bodies are generally carried, by the increased lachrymal secretion, along the sulcus formed by the apposition of the eyelids, to the inner canthus, and there discharged. And, in order to favour this natural process for removing extraneous matter, the patient should be directed to keep the eyelids shut, and as quiet as possible, to cover them with his hands, and to blow his nose forcibly: thus the greater number of the extraneous particles will be got rid of. Those which remain lodged in the membranes must be speedily removed by those artificial means which have been already enumerated. If entropion is the cause of the inflammation, the eyelashes are either plucked out, or completely destroyed by removal of their roots. The inflamed organ should be carefully protected from the stimulus of strong light; the patient is to be placed in a darkened room, and the eye protected by a thin green shade. The shade, however, may be worn too long, so as to induce an extremely weak and tender state of the organ.

If there be good grounds for believing that the incited action has been caused by suppression of any discharge, that should be encouraged to return, and the cause of the suppression must be avoided. If a gonorrhœa have been suddenly arrested by the employment of stimulating injections, these must be instantly discontinued; and some have even gone so far, in such cases, as to introduce bougies impregnated with gonorrhœal matter, in order to procure a renewal of the discharge. In cases of suppression of purulent discharge from the ears, or the surrounding parts, followed by external ophthalmia, a blister or sinapism should be applied in the neighbourhood of the part from which the discharge formerly issued. When the menstrual evacuation has been arrested, leeches and fomentations should be applied to the pudenda, or around the anus, and emenagogues administered internally; the patient should be placed in a quiet and well ventilated apartment, and kept free from any emotions of the mind; all noise and other sources of irritation should be studiously avoided.

If the incited action in the eye do not subside, as it often will not, on removal of the exciting cause, recourse must immediately be had to very active means for its subjugation; for in no other organ does inflammatory action proceed more rapidly to an unfavourable termination. By timely use of antiphlogistic means, those consequences of external ophthalmia, which we have already treated of, may be avoided; and, with respect to most of them, it is much better to prevent their occurrence, than combat them after they have been allowed to take place. The eye is more valuable to a great proportion of people than a limb; and the surgeon is very culpable if he be not master of this part of his profession, and able to undertake the management of every disease and accident to which the eye is liable. "In cases of inflammation the general treatment is the same; but each variety requires peculiar attention during the cure, depending on the structure and function of the tissue affected."

In the *first stage* of external ophthalmia, active antiphlogistic measures must be put in force. In full habits, and cases of intense action, general bleeding must be employed, even to fainting, from the veins of the arm or of the neck, or from the temporal artery,—and repeated, if necessary, according to circumstances. Blood is sometimes abstracted by cupping from the temples or the nape of the neck; but it is a painful and uncertain mode of emptying the vessels. Local bloodletting, in many cases, suffices to moderate the action; in all it is most beneficial and important, after the employment of general depletion. The application of leeches to the inner canthus is the most effectual method of abstracting blood locally, as at that point the venous return is made from the eye. If placed on the temples, they can produce very little benefit; if on the outer surface of the eyelids, ecchymosis follows, on account of the extreme looseness of the cellular tissue in that situation. Or the angular vein, at the inner canthus, may be opened with a lancet, and a considerable quantity of blood thereby abstracted from the seat of the disease. Leeches applied to the conjunctiva of the lower lid are sometimes advantageous; but leeching and scarification are more useful in the chronic stage: and the latter is injurious in acute ophthalmia. Saline purgatives, and antimonial medicines, a very material part of the antiphlogistic regimen, must not be omitted. Enemata, with occasional pediluvia, are much recommended by some Continental writers. In bilious habits emetics, followed by mercurial purges, will be found very useful. With respect to topical treatment, warm applications are found to afford decided relief in the first stage, and are, in consequence, generally used. By some, however, cold water, or water with vinegar, is applied from the first. Poultices, whether warm or cold, prove annoying from their weight. Warm fomentations, simple or anodyne, are preferable, and may be repeated according to the feelings of the patient; or the eye may be exposed to the steam of water.

When by these means the violence of the symptoms has abated, as usually happens in the course of a very few days, the organ must be gradually accustomed to its natural stimulus, light. The shade must be discontinued, and the room no longer darkened; and now leeching becomes of great service, while the evacuation is to be followed by gently stimulating or astringent applications, so as to produce contraction of the still dilated, though partially emptied, vessels. Various collyria may be employed for this purpose. Solutions of the sulphate of zinc, of muriate of mercury, of sulphate of alum, of acetate of lead, or of the lapis divinus — wine of opium — the citrine ointment, or the unguentum oxydi hydrargyri rubri, &c. — or stimulating vapours of various kinds. Camphor is a good addition to many of the applications. The collyria may be cold, or slightly warmed; and may be dropped into the outer canthus, flowing over the eye, and escaping by the inner canthus, according to the natural course of the fluids of the eye; or they may be inserted at the inner canthus, the head being immediately afterwards inclined so as to allow the fluid to pass towards the external canthus; or they may be applied by means of an eyeglass. Warm fomentations, and other relaxing remedies, however useful during the first stage, are worse than useless, are hurtful in the highest degree, when the affection has passed into a chronic state; as also are antiphlogistic means, and exclusion of light, — remedies so essentially necessary in the first stage.

In ophthalmia, attended with profuse *purulent* discharge, the structure of the eye is in great danger of being destroyed, from the intensity of the action, and its liability to extend to the deep parts of the organ; the most active practice is required from the first. Copious general depletion, ad deliquium, must be quickly had recourse to; and the patient must be freely purged, and kept in a state of partial nausea for some time, by exhibition of antimonials. After general bloodletting, the repeated application of leeches to the inner canthus is necessary, in order to empty sufficiently the vessels of the part. Where the chemosis is so extensive as to bury the cornea, as it were, beneath the folds of the swollen conjunctiva, sloughing of the transparent tunic is frequently threatened. In order to arrest this fatal result, much good is often obtained by division of the chemosis. A sharp-pointed bistoury is passed through the swollen membrane, and radiating incisions practised, commencing at the corneal margins, and directing them towards the circumference of the globe. Sometimes four or even five of such divisions are called for, while care is taken not to wound the sclerotic coat beneath. A considerable quantity of blood is sometimes lost by this procedure, and, the chemosis subsiding, the cornea is saved. Infusion of tobacco, solutions of acetate of lead, and nitrate of silver, æther and laudanum, have been used as applications to the eye from the very commencement of the affection; but the propriety of the practice appears very questionable. Blistering the nape of the neck proves highly beneficial, after the employment of the antiphlogistic measures; and in many cases it is necessary to keep up discharge from the blistered surface for some time. On subsidence of the violent symptoms, the swelled conjunctiva is to be attacked with escharotics and stimulants, as the nitras argenti, sulphas cupri, or various collyria: then only can such applications be advantageous; at an earlier period they must do harm. They repress the exuberant granulations which may have formed, or may be forming, on the conjunctiva of the eyelids, promote contraction of the dilated vessels, diminish the relaxation of all the tissues, and stimulate the now dormant action of the part into a healthy state of excitement. Gently stimulating collyria may be injected betwixt the lids, by means of a small syringe. In granulated conjunctiva, it is sometimes necessary to remove a greater or less part of the diseased membrane by escharotics, the knife, or scissors; and after this has been accomplished it is well to encourage bleeding to a slight extent. In removing part of the palpebral conjunctiva, care must be taken to avoid injuring the cartilage of the tarsus; and, in the lower lid, not to take away too large a portion, lest entropion should occur during cicatrisation. In hospital practice, the infected should be separated from the healthy; and promiscuous use of towels and sponges must not be allowed.

In *Purulent Ophthalmia of Children*, antiphlogistic means must be pursued, if the patient is seen during the first stage of the disease; but children do not bear depletion well. After the discharge is established, the surface of the eye must be kept free of matter, by frequent injection of a bland, tepid fluid; and stimulating or astringent collyria should be applied three or four times a-day.

When *Inflammation of the Cornea* is established, it is exceedingly difficult to procure contraction of the vessels. Active antiphlogistic measures must be employed in the acute stage; and in the chronic, stimulant applications are to be had recourse to. As, however, corneitis is frequently kept up in its chronic form, from deficient constitutional power in strumous habits, strict attention must be paid to the diet and secretions of the patient. Mild mercurial alteratives, diaphoretics, and tonics combined, will often effect a cure, where all local treatment has been tried in vain. When a large plexus of vessels remain dilated on the part, the most effectual method of removal is to divide them, as they ramify on the sclerotic, by means of scissors, or a fine knife, and afterwards to employ stimulating applications.

The irritability of *ulcers* on the cornea is diminished by the application of nitrate of silver, in solution or substance. If in solution, the application is used in the proportion of three to ten grains of the salt to the ounce of distilled water; if in substance, a portion, finely pointed, is gently applied to the sore, which may be afterwards besmeared with a little oil or simple ointment, in order to confine the action of the nitrate to the ulcerated part. It is not necessary, but, on the contrary, hurtful, to rub the caustic freely on the sore; a very slight application is sufficient to coagulate the secretions on the part, and form a covering for protection of the surface. In two or three days afterwards, when the temporary covering has become detached, and when the irritability of the sore has in consequence returned, it will be necessary to repeat the application, but not till then. On each application, and few are in general required, the sore is found reduced in size considerably. The collyrium nitratis argenti is very useful in many obstinate cases of affections of the eye and eyelids, the strength of the solution being varied, according to circumstances.

In *Albugo* and *Leucoma*, proposals have been made for excising, scraping, or perforating the opaque part; but the cure by such means is worse than the disease, as a raw surface is left larger than the previous opacity, and the cicatrix which must inevitably form also occupies a larger space, and is equally opaque. Leucoma and Albugo are incurable diseases, though the opacities may become somewhat thinner, by natural processes, after the lapse of a long period. *Nebulæ*, however, are often removable. During the treatment of them, or, rather, before beginning to treat them, it is of the utmost importance to attend to the state of the surface of the eye, and of the lids and eyelashes. Stimulating substances may be applied in cases where the opacities are thin: powders of calomel, aloes, sugar, &c., have been blown into the eye; stimulating lotions or ointments are preferable; one containing the nitrate of silver, with the addition of a proportion of the liq. sub-acet. plumbi, is sometimes used with advantage. These, however, are often of no avail, unless the dilated vessels, when such exist, are divided, or a portion dissected out; afterwards stimulants will be efficacious, and must be used assiduously. The vessels may require to be divided again and again.

In *Ophthalmia tarsi*, gently stimulating ointments or lotions are to be used, and in obstinate cases much advantage will result from the application of blisters behind the ears and to the nape of the neck, or from the insertion of a seton in the latter situation. In children it is necessary to correct the state of the bowels, scarify teeth, and remove other irritating causes to which that tender age is liable.

Sloughing of the Cornea should, of course, be prevented, if possible, by subduing the incited action before it has attained such intensity as to overcome the power of the part. The slough is slow in separating when the constitution has been much weakened; and sometimes tonics and stimulants, both external and internal, are required to hasten the process of separation. When the surface has at length become clean, the same treatment is required as to an ulcer of the part.

Conical Cornea. — This deformity can scarcely be cured, nor can any optical contrivance effectually remedy the disturbance of vision. When the apex of the cone is opaque, the removal of the pupil to the circumference by operation affords the best chance of assisting the sight of the patient.

When *staphyloma* is small, neither impeding the motions of the eye, nor preventing its being protected by the lids, no surgical interference is called for, as the loss or impairment of vision cannot be remedied, and as no other inconvenience than blindness is produced by the change of form in the part. But when the diseased cornea projects from between the eyelids the prominence must be diminished, on account of the deformity which it occasions, and in consequence of the eye being deprived of its natural protection of the lids, and being thereby exposed to constant irritation. In such cases it is necessary to take away a portion of the cornea, that the eye may be so diminished in bulk as to retract within the eyelids; the size of the part removed must be proportioned to the degree of protrusion. A cornea-knife is passed into the prominence, and carried forwards so as to transfix the part, in a direction from the external to the inner canthus; and by the knife being carried on, with its cutting edge looking downwards, a flap of the cornea is made. This flap is then laid hold of by means of forceps, and removed either with the knife or with scissors. The aqueous humour immediately escapes, and in most cases the crystalline lens and vitreous humour are also discharged. The eye consequently shrinks, and retracts within the palpebræ. The cut margins of the cornea soon assume a reddish appearance — they form granulations, the wound contracts gradually, and ultimately closes; but the eye is necessarily much shrunk, and totally useless as an organ of vision. Generally suppuration takes place, causing complete disorganisation of the parts; and the preceding inflammatory action may be so intense, and attended with so much constitutional disturbance, as to require active measures for its moderation. Deformity may be in a great measure removed by adapting an artificial eye to the shrivelled remains of the natural one. When it is necessary to remove only a small part of the cornea, the aqueous humour alone escapes, and during the cure of the wound the patient not unfrequently enjoys a tolerable degree of vision; but after the wound has completely closed, vision is again lost completely.

Hydrophthalmia, also, is a disease in which little hope can be entertained of materially benefiting the patient. In the slighter cases, in which no very annoying symptoms accompany the affection, vision may be improved by the use of optical instruments; mercurial preparations may be employed in moderation, with the view of promoting absorption of the superabundant fluid. When the disease has made considerable progress, temporary relief may be obtained from puncturing the cornea at its lower part, so as to discharge the accumulated aqueous humour; but a cure can scarcely be expected from such a practice, however often the paracentesis may be repeated. In the worst cases the pain is so excruciating, and the system so much disturbed by the local affection, as almost to warrant the destruction of the organ, in order to relieve the patient; but, after all, even such severe measures will most probably prove unavailing.

In *Exophthalmos* the treatment must vary according to the circumstances which cause the protrusion of the eyeball.

Of Internal Ophthalmia. — Inflammation of the internal parts of the eyeball sometimes supervenes on conjunctival inflammation, and then the distinctive characters of the two affections are not perceptible. When inflammatory action attacks the deep parts primarily, the external ciliary vessels ramifying on the sclerotic coat are seen, enlarged, shining through the conjunctiva; and, as they advance towards the clearer part of the eye, they form a zone of a pink colour, whose vessels run in a straight direction towards the margin of the cornea; but between the zone and the cornea a distinct white line is often interposed. Then large arborescent and reticulated vessels soon appear on the white part of the eye; and from their being more superficial than the first, and of a brighter hue, it is obvious that they belong to the conjunctiva. They also approach the clear part of the eye, and, if numerous, obscure the former vessels — as also the red zone and white line — for they pass over them, and reach the corneal margins, and often go beyond it, in continuous ramifications. The sclerotic, in consequence, assumes a pink-red colour, and the cornea becomes dim.

The iris may be primarily and principally affected, and, if so, the disease is termed *Iritis;* but in most cases all the other internal parts suffer more or less. The iris changes its appearance, becomes of a dusky hue, either in part or throughout, and red vessels are sometimes distinctly seen in it; from grey or blue it changes to a greenish colour, and when formerly black or brown it becomes reddish. The size of the pupil diminishes, and the contraction is often irregular, when the inflammatory action is intense. The iris swells perceptibly, and the pupil loses its dark colour, or is almost entirely closed, either from effusion of lymph, or from inflammation and consequent opacity of the crystalline lens and its capsule. The iris projects forwards, and diminishes the capacity of the anterior chamber; the pupil is irregular, and often assumes an angular appearance; and the irregularity becomes permanent from adhesion of the pupillary margin of the iris to the capsule of the lens, lymph being effused and organised, and forming a firm uniting medium between the parts. Occasionally adhesions form at the middle of the iris, and cause so great contraction as to give the pupil an appearance of being double. Of course irregularities of the pupil are most distinct when the part is dilated, either spontaneously or by the application of belladonna. Tubercles sometimes form on the iris, and not unfrequently it presents a granulated appearance. From the commencement of the inflammatory attack the patient feels great pain in the organ and in the forehead, and there is great intolerance of light. There is a feeling of tension of the eyeball, followed by deep throbbing pain increasing every instant. As the disease advances, the cornea is rendered opaque by the fulness of the chambers, and the aqueous humour becomes turbid and of a milky appearance; or lymph is effused into the anterior chamber, and floats about in flaky portions. Occasionally the vessels of the iris are so distended as to give way, causing effusion of blood into the chamber, often in considerable quantity.

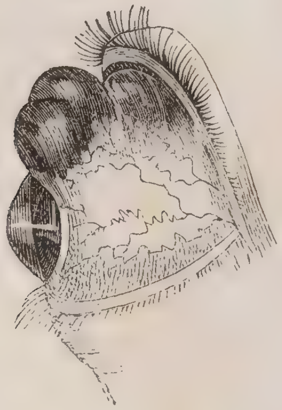
More frequently, however, puriform fluid is deposited, occasioning the appearance termed *Hypopium.* The pus is either fluid or of a thick curdy consistence: when fluid and thin, it mixes with the aqueous humour, rendering it white and opaque; if of firmer consistence, it lodges in the lower part of the chamber, but changes its position, and mixes partially with the humour, on the head being moved; when dense and curdy, it remains separate from the humour, and its position is not altered by motions of the head.

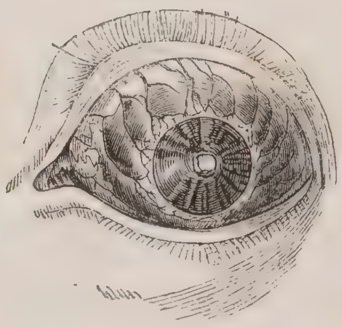
During the progress of the inflammatory action, all the symptoms increase; the pain shoots to the top of the head, and is much aggravated by pressure on the eyeball. Of course vision is materially impaired. Constitutional disturbance always accompanies the affection, and exists in a greater or less degree according to the extent of the disease. The iris may be primarily affected, but the other textures, both external and more deeply seated, too often become involved; and in aggravated cases the whole eyeball suffers. When the most internal parts, as the choroid coat, the retina, and the vitreous humour, are affected, sudden and bright flashes of light disturb the patient, whilst vision is rapidly lost, and for ever. Occasionally the intense over-action terminates in suppuration of all the affected textures, and the eyeball soon becomes completely disorganised.

In *Rheumatic Ophthalmia* the appearances of the diseased eye are similar to those in ophthalmia produced by any other cause. But the affection is accompanied with, and seems to arise from rheumatic diathesis. There is pain in many of the joints, and frequently in the scalp and portions of the face, increased on hanging the head, and by pressing the parts. The pains are remittent, supervene at night, and subside in the morning. In general the ophthalmia is external; but in severe cases the internal parts become affected, and the eye is sometimes lost by giving way of the cornea.

Internal ophthalmia is often occasioned by wounds inflicted either accidentally or by operation. Laceration of the iris in the extraction of cataract, or an improper performance of the operation for cataract with a needle, is by no means an unfrequent cause of the affection. Iritis often occurs during the exhibition of mercury in undue quantities, and is said also to be a symptom of syphilitic taint. It is, in many cases, preceded by cutaneous eruption, and seems to be the consequence of the eruption being repelled, or interfered with in its progress.

Choroiditis. — The choroid membrane is sometimes primarily affected: but more frequently the inflammation of this tunic is the consequence of sclerotitis, or the disease last described. When the result of the former cause, it generally takes on the rheumatic type. The early symptoms are zonular redness of the sclerotic, accompanied by a general impairment of vision, so that the patient expresses himself as if looking through gauze or some dark network. Presently the sight becomes more and more impaired, until a complete amaurosis results. The pupil is generally in a semi-dilated state, and, instead of presenting the intense black hue of the healthy eye, it reflects a greenish-grey colour, dependent upon the effusion of a turbid fluid between the choroid and retina. The nervous structures, becoming thus pressed upon, lose their sensibility to light, and are paralysed. This form of inflammation is generally chronic, and imperceptibly advances to the iris anteriorly, and to the retina within; the ultimate termination being complete glaucoma. Various dull and heavy pains accompany this affection; and, in the latter stages, acute circum-orbitar neuralgia is the most distressing concomitant. By long-continued chronic inflammation the sclerotic coat appears to lose its powers of resistance — the accumulating fluid pushes before it the weakened tunic, and *Staphyloma Scleroticæ* is produced. This protrusion of the external tunic sometimes takes place in various parts, and to a considerable extent, so that the figure of the globe is entirely lost. The thinning of the sclerotic at these points allows the dark hue of the choroid to shine through, and this, together with the bunched-like appearance of the protruded portions, has entailed upon it the name of *Staphyloma Racemosum.*





Treatment.—In the first stage of internal ophthalmia, active treatment, properly conducted, should be successful in averting the progress of the disease; in the latter stages, there is every chance of vision being entirely lost. The treatment must be actively antiphlogistic, consisting of general and local bleeding, the internal use of purgatives and antimonial medicines, and strict abstinence. A free use of mercury internally is said to check the disease, and, in its advanced stages, to procure absorption of effused lymph. But the inflammation can be subdued without the aid of that mineral, though its effects are often powerful; and a recollection of the bad effects which are so apt to follow its employment renders a prudent surgeon cautious in having recourse to it. Mercurial ointment, with opium, rubbed on the forehead, immediately above the affected eye, gives great relief. The same relief follows friction with oil, in which the muriate or other salts of morphia is dissolved. When the incited action declines, the extracts of belladonna, hyoscyamus, or stramonium, rubbed on the eyelids and brow, procure dilatation of the pupil, and thereby tend to prevent its further contraction; but whilst acute inflammation exists, the pupil is not dilatable; and it is consequently an encouraging symptom when the pupil begins to yield to the influence of these medicines. In hypopium it is sometimes necessary to evacuate the pus when effused in large quantity, in order to prevent the injurious effects that its pressure might occasion; but, if the quantity be small, there is a good chance of its being removed by absorption, In suppuration of the eyeball, whilst the other eye remains sound, it may be prudent to open the cornea, and allow a free exit for the matter, in order to prevent the healthy eye from becoming affected. In the staphyloma of the sclerotic coat, when the eye, as it were, is affected by a sort of chronic dropsy, (and this disease is met with at various periods of life,) the tension and bulk of the organ may be diminished by occasional puncture. The opening may be kept pervious by the introduction of a conical probe from time to time. I have more than once introduced a silk thread through the most dependent and prominent part of the globe with good effect. The organ ultimately shrinks.

Amaurosis implies an impairment of vision more or less complete, arising from disease in the brain, in the optic nerve, or in the retina, whether consisting of change or destruction of structure, or derangement of function. Vision may be diminished or lost by organic disease in the coats or humours of the eye, or by morbid formations in the orbit; but to such the term Amaurosis does not strictly apply. But, after establishment of the disease, other textures of the eye may, and often do, become affected. Usually one eye at first is amaurotic; but the other soon participates, and ultimately vision is impaired or entirely lost in both. The disease may occur idiopathically, or be symptomatic of other affections.

The general symptoms of amaurosis are the following. Headache is felt for some time, either constant, or, as is most commonly the case, occasional, and most severe in the forehead: in many cases the pain is at times most excruciating. The eyesight gradually becomes weak ; distant objects are unusually obscure, or not at all observed ; and those which are near cannot be accurately discerned. For a short time vision may seem to be restored, but soon it diminishes more and more, all objects seem to be enshrouded in a mist, at first thin and shadowy, but gradually becoming opaque and impenetrable ; or a feeling is communicated of dark network obstructing the view. Unnatural impressions are made on the retina ; flashes of strong light, or luminous sparks, appear to dart across the eyes ; darkened spots are seen where none exist ; gnats, flies, or other minute bodies, various in colour and brilliancy, seem to flutter before the face ; or a single dark speck intercepts the vision. Usually the pupil is dilated and the iris insensible to the stimulus of light ; and the former has not its natural translucent aspect, but is dull and cloudy. But the state of the pupil cannot be accurately determined in amaurosis, for not unfrequently it is much contracted, and in many cases the iris retains both its natural appearance and the full exercise of its functions. The disease either advances to complete blindness, or stops in its destructive progress, leaving the patient with vision impaired to a greater or less degree. When the disease is established, pain in the head and eyes usually either ceases quickly and entirely, or gradually abates.

Amaurosis is sometimes temporary, occurring at regular intervals; and, during its accession, it often varies in intensity. With some patients strong light is intolerable, and vision is best in the twilight; others court sunshine, finding their eyesight thereby much improved; accordingly the former are said to labour under nyctalopia, the latter under hemeralopia. Some can discern the shape of objects, but either have no perception of the colours, or mistake the individual colours ; others not only see all objects indistinctively, but conceive them distorted, double, or extensively multiplied : in some one-half of the object looked upon is obscured — and frequently there is strabismus, in consequence of the paralysis being only partial.

Organic amaurosis (that depending on organic disease) may arise from the change of structure consequent on inflammatory action in the retina, whether chronic or acute — from atrophy of that membrane and of the optic nerve — from extravasation into the substance of the nerve, or compression of it by morbid formations — from softening or suppuration of the nerve and its connexions — or from various diseases of the encephalon. Functional amaurosis may proceed from temporary plethora about the optic nerve and retina — from intense and long continued use of the organ — from derangement of the digestive apparatus — from general debility, however induced — from excessive influence on the system of poisons or powerful medicines — from concussion of the nervous and cerebral substance, or from long continued irritation in the neighbourhood of the eye. Amaurosis may also follow injuries of various kinds.

In the treatment of organic amaurosis but little can be done, and that little is unsatisfactory. In the functional form, however, vision may be improved, if not wholly restored, by removal of the exciting cause, and the carefully avoiding of such circumstances as seem to predispose to the affection. After due constitutional treatment, considerable benefit is often derived from counter-irritation; and I have in many cases witnessed the good effects of blistering the temples and besprinkling the raw surface with the powder of strychnine, — a practice very far from nugatory. On removing the blister, the cuticle and lymphatic effusion beneath are carefully scraped away, and from one-eighth to one-half of a grain of the powder dusted over the exposed cutis. The sprinkling is repeated daily, and the dose gradually increased. When the surface dries, a fresh blister is applied, and the use of the powder resumed. It may be employed, when gradually increased, to the extent of two grains on each temple; but, if spasmodic twitchings and constitutional disturbance begin to show themselves, it must be immediately abandoned, and not resumed till after some days, and even then in diminished doses. In not a few cases, both of complete amaurosis, and of vision impaired to such an extent that the patient could merely distinguish light from darkness, I have by this practice succeeded in restoring the sight completely; in others, vision has been very much improved. Still, by far the greater number of amaurotic patients are incurable; and even those who have derived benefit from strychnine are, I am strongly inclined to suspect, exceedingly liable to relapse.

In the treatment of functional amaurosis, it will be necessary to investigate minutely the causes on which the defective vision may depend. Thus we may find a congestive state of the retina or brain, arising from suppressed natural discharges, as the menstrual flux, or the sudden suppression of habitual but morbid discharges, as the healing of an old ulcer, &c.

Again, amaurosis may be the result of irritation in some portion of the alimentary canal, as from the presence of worms. Patients who have long laboured under imperfect amaurosis have occasionally been suddenly relieved by the discharge of a tape-worm. Difficult and painful dentition in children not unfrequently gives rise to this disease. Hence the treatment of functional amaurosis will necessarily vary with the cause; and no general rule can, with any propriety, be laid down as to our selection of remedial measures.

Glaucoma, or green cataract, is a disease of the hyaloid membrane and vitreous humour, probably depending on a varicose state of the bloodvessels. The pupil is usually dilated, irregularly oblong, the iris being narrowed towards the upper and inner side. There is a dull shining appearance at the bottom of the eye, not fixed as in cataract, but varying according to the position of the light. The lens becomes opaque and greenish as the disease advances, vision gradually diminishes, and the iris is immovable. After sight is lost, the patient has a perception of a luminous appearance in the organ when pressed upon. Both eyes are generally affected, one after the other; headache, often violent, attends the disease; many remedies, both external and internal, may be tried on recommendation, though without effect: the disease seldom, if ever, admits of cure.

Of Cataract, or opacity of the crystalline lens and its capsule, attended with partial loss of vision. — The disease is, in general, gradual in its progress: but sometimes it advances rapidly, as when occasioned by a blow or wound. When slow, the opacity commences in the centre of the lens, and extends gradually towards the circumference. Before any change can be preceived in the organ, the patient sees objects as if covered with a mist or veil; and, as the opacity becomes distinct, vision is gradually impaired. During the day, vsion is very indistinct, as the pupil is contracted, and the rays of light reach the retina only through the opaque centre of the cataract. But during twilight vision improves, as then the pupil becomes dilated, and admits of transmission of light through a portion of the transparent vitreous humour, as well as through the semi-opaque margins of the crystalline lens: for a similar reason, it is also more distinct after the application of belladonna or hyoscyamus either to the eye or to its neighbourhood. In the ordinary state of the parts, a clear black ring is often visible around the opacity, either from the margins of the lens being unaffected, or from the posterior surface of the pupillary portion of the iris being pushed forwards by enlargement of the lens. Patients, having become aware of the great improvement of vision caused by dilatation of the pupil, are often contented to use narcotic remedies externally, so long as they retain their dilating influence — and, strange to say, they do not soon lose it — instead of submitting to any operation. As cataract advances, even luminous bodies cannot be accurately distinguished, though the situation from which the light proceeds is perceived; thus the patient in a clear light may have an indistinct perception of a candle or window, and in some cases even of the bars of the window. The motions of the iris are not affected, unless, in rare cases, when the cataract is large and compresses the iris; or when the functions of the third pair of nerves have been in any way impaired; or when the iris has been the seat of acute inflammation.

Cataract may be confounded with other diseases of the eye, as with amaurosis. But, in amaurosis, opacity, when it exists, is deep, concave, greenish, or of a metallic appearance; whereas, in cataract, it is of a more or less white colour, convex, and situated immediately behind the pupil.

Cataract may be *lenticular* only, the lens being opaque whilst its capsule remains transparent. In such a case the disease is slow in its progress, and the opacity uniformly commences in the centre of the lens, and gradually extends to the circumference. The degree of opacity varies in different cases, from cloudy dimness to complete whiteness. In general the predominant hue is white or greyish, but not unfrequently the opacity is of several colours, and occasionally of a mottled appearance. The consistence also of lenticular cataract varies, being sometimes fluid, occasionally extremely dense and almost osseous, but most frequently of caseous consistence. When fluid, the cataract is of larger size than the healthy lens; when caseous, the part usually retains its former dimensions; and when dense, the lens is often considerably diminished in size. The motions of the pupil are seldom, if ever, affected.

Cataract may be entirely *capsular*, the capsule being opaque, whilst the lens either remains free of disease, or has been removed by natural or artificial processes. The opacity in this case does not always commence in the centre, but frequently begins at the margin, and is of a spotted or mottled appearance, and in general not uniformly opaque. No black ring around the opacity is observed, though the pupil be dilated; and the motions of the iris are sometimes slow. The opaque spots are said sometimes to move when the position of the head is changed. The anterior portion of the capsule, the posterior, or the whole, may be affected; but the anterior is the part which most commonly becomes opaque in the first instance.

In many cases both lens and capsule are affected; and then the cataract is termed *capsulo-lenticular*. Occasionally the diseased lens, in such circumstances, is of fluid consistence; and in many cases is spotted.

Portions of lymph, organised or not, lodged in the posterior chamber, have by some been termed *spurious* or *adventitious* cataract; since, when the pupil is shut by such effusion, the appearances presented are somewhat similar to those caused by opacity of the lens, or of its capsule. Such deposits, however, can readily be distinguished from true cataract, being in general of a yellowish colour, in close contact with the posterior surface of the iris, and, when organised, often streaked with red vessels. Generally, too, the pupil is irregular from adhesions between the lymph and the pupillary margin of the iris.

Cataract would, in some cases, appear to be hereditary,* and frequently it is a congenital affection. In very young children it may be caused by imprudent exposure to strong light. In adults it often seems to be produced by the action of strong reflected light, as by exposure to intense fires in forges, glasshouses, &c., or by a dependent position of the head, accompanied with exposure to light. People advanced in life are most subject to the disease.* It is not an unfrequent consequence of internal ophthalmia, and almost invariably follows the slightest wound or most delicate puncture of the lens: it often occurs after slight injury of the lens or its capsule, inflicted during attempts to form an artificial pupil. Cataract may occur rapidly from extensive dilatation of the lenticular vessels; or from such an injury of the eye as causes laceration of the vessels supplying the capsule and lens, detaches them from their other connexions, and consequently leaves them without a nutritive source.

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* [Dr. Maunoir, of Geneva,[a] relates a curious instance, strongly corroborative of the occasional hereditary tendency of this affection. While investigating this subject, he became acquainted with the history of a woman whose grandfather, uncle, two aunts, and two cousins, all on the paternal side, had had cataract, and who had all been operated upon. She herself, at the age of twenty, was attacked with it. Finally, out of four children which she had, one was born with cataract; and, what is remarkable, neither her father, mother, nor sisters, had ever had any affection of the kind. The same writer states that Roux once operated for this disease upon three brothers, whose father and grandfather had suffered similarly. A brother, much younger than themselves, had the affection in its incipient stage. Instances more frequently occur in which several members of a family are affected with cataract, without any traceable hereditary predisposition on the part of either parent. Professor Drake met with a case not long ago, where five out of nine children were blind from this cause; and last autumn I operated on two boys and a girl from Mississippi, who had lost their sight in a similar manner. — Ed.]

[a] Essay on Cataract, translated by Dr. Bowditch, of Boston.

Cataract sometimes, though rarely, disappears spontaneously, being absorbed; but most frequently an operation is required to remove the opaque body from the axis of vision, though no hurry is necessary in having recourse to it. The chance of success from operation must depend very much on the state of the different parts of the eye, on the kind of cataract, and on the state of the constitution. Many remedies, external and internal, and mercury amongst the rest, have

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* [The two subjoined tables, the one constructed by Mons. Maunoir, and the other by Professor Fabini, demonstrate the immense influence which age exerts upon the production of cataract: —

TABLE I.

From 20 to	29 years	5 patients
30	39	3
40	49	11
50	59	25
60	69	41
70	82	27
		112

TABLE II.

From 1 to	10 years	14 patients.
11	20	16
21	30	18
31	40	18
41	50	51
51	60	102
61	70	172
Above	70	109
		500

It has been said that men are more liable to cataract than women; the difference, however, if any, is probably very slight. Thus, in the first table, 61 were males and 60 females; in the second, 268 were males and 232 females. — ED.]

been employed with the view of dissipating cataracts; but all are of no use. An operation, of one kind or another, only can be relied on. And still, even in favourable cases, and in the best hands, the contingencies attending operation are so great, that success cannot be absolutely promised or expected. The mode of operating, and the kind of operation, must be varied according to circumstances; and great experience is required to determine the proper course of procedure in each case. Steadiness is absolutely necessary both in the patient and the operator, in order that the proceedings may be carried to a happy conclusion. The operator must have a good eye; a steady, light, and skilful hand; a fine touch; courage and caution — qualifications necessary in all surgical operations, and in none more so than in those on the eye.

When cataract is spontaneous, and vision not altogether lost, the patient being able to distinguish bright objects, though unable to direct his steps or follow his avocation — when the pupil is quite sensible to the application or abstraction of light, or to the use of belladonna, &c., — when all the external parts are sound, the cornea clear, the chambers of the proper size, and no reason to suspect that the retina is affected — the prognosis in regard to the effects of operation is good. When, on the contrary, the organ or the constitution is not sound — when the patient is irritable in habit or temper, or subject to gouty, rheumatic, or catarrhal complaints — when headache has preceded the opacity, and vision is gone, or nearly so, with flashes of light seeming to pass before the eyes — the prognosis is very unfavourable. But even total blindness must not always be considered as an indication of operation proving useless, for sometimes the retina recovers its sensibility after removal of the cataract, and thus sight has been restored in very hopeless cases. There is no objection against operating, though one eye only is affected. By some, operation is recommended as prudent, with a view of preventing the opposite eye from suffering by sympathy; whilst others consider it more safe to refrain from operating, lest violent inflammatory action should follow, and, by extending to the other eye, cause disease there. However, when the cataractous eye does not present such appearances as forbid operation, I conceive it both prudent and safe to remove the obstruction to vision, provided after-treatment is carefully attended to, and all untoward symptoms actively combated as soon as they appear. There is still a considerable difference of opinion on the subject; but the patient, being anxious to get rid of an inconvenience and deformity, often decides for the surgeon. When both eyes are cataractous, a question arises as to operating on both eyes at once. From my own experience I should say, that both eyes ought not to be operated on at one time: if they are, there is great risk of violent inflammation being established, and of the operation failing to restore vision. Immediately after one eye has been operated on, the other becomes very unsteady, and is altogether in an unfavourable state for operation; and, if interfered with, the chance of a happy result is but slight. But by operating on each eye at different times, much less risk is incurred, and the chance of success is doubled.* Cataract may be operated upon at all ages, excepting infancy and the period of dentition. In congenital cataract, the eyes acquire an uncontrollable rolling motion, and, if operation be delayed till the patient has attained a considerable age, such motion cannot be afterwards prevented. In such cases, therefore, the disease should be attacked as soon as dentition is completed, for then an operation can be undertaken with as little risk of injury to the organ as at a more advanced age; and a child of twenty months or two years is unconscious of what is intended, and can be more readily secured than at any after period; besides the best period for education is lost if an operation be not done early.†

Cataract is not remediable but by surgical operation. It may be removed altogether by incision of the tunics of the eye, and extraction of the opaque body; or by the introduction of a needle, it may be displaced from the axis of vision, or so disturbed as to be acted on and removed by the absorbents.

Operation with the needle is more generally applicable than that with the knife, and is more easily performed. But much mischief may be done with a needle, if the operator be not both cautious and dexterous; by unskilful use of it many eyes have been lost.

In operations for cataract on the adult, the patient, having the eye which is not the subject of operation covered, may be seated on a low chair, opposite and near to a north window, in order that clear light may be obtained. His head is supported on the breast of an intelligent assistant standing behind. The upper eyelid is raised by the assistant's fore and middle fingers of the left or right hand, applied so as to stretch the lid over the bulb; and the other hand is placed under the patient's chin, to steady the head. The eye may be very well fixed by the fingers of the right or left hand of the operator himself. He is, in that case, more conveniently placed behind or above the patient's head. The use of a speculum, for elevating the lid or fixing the ball, is seldom admissible; and, if the eye be so unsteady or sunk as to require it, the surgeon ought not to attempt extraction. No one method can be exclusively followed; by a man of judgment, experience, and skill, the operation will be varied according to circumstances.

The operation may be performed with the needle. The cataract is either *depressed* or *reclined*, and is then said to be couched. Depression is preferred by many good authorities in surgery. The needle is introduced at a line — or a line and a half, so as to avoid the ciliary processes — from the junction of the cornea with the sclerotic, towards the external canthus, and below the transverse diameter of the eye; and the opaque lens, if solid, is entangled with the point of the instrument, and pushed into the lower part of the ball. Thus the opaque body is removed from the axis of vision, so as not to obstruct the passage of rays of light to the retina; and, in successful cases, it is highly probable that the lens, after being detached and displaced, is altogether removed by the absorbents. Violent inflammation occasionally takes place after the operation, followed with destruction of the eye from suppuration; or the iris becomes paralytic; or the pupil closes, and sight is gradually lost; or the cornea becomes flaccid, with congestion of the vessels and turbidity of the humours. The needle should be of a conical form, thickest towards the handle, so as to prevent the humours from escaping during its introduction. It should also be straight, excepting a short curvature of its point, rather slim than otherwise, and not longer than from an inch to an inch and a quarter. The extracts of belladonna or stramonium should be used in all cases, previously to determining upon operations, in order to ascertain the state of the humours, the size of the cataract, and whether adhesion of the iris to the capsule of the lens exist or not. Dilatation so produced is allowed to disappear almost entirely before the operation is proceeded in. It is sometimes necessary to steady the eye by means of a speculum, and the wire one of Pellier is the best. By pushing the needle, held like a writing pen, gently forwards, and towards the inner canthus, in a direction almost parallel with the iris, its point is seen in the posterior chamber, opposite the pupil. The instrument is then fixed in the opaque lens, and the cataract is depressed obliquely downwards; the needle is disentangled by a gentle twisting motion, and then withdrawn in the same direction as it was entered. Before depressing, it is necessary to lacerate the capsule of the lens, and this is accomplished by giving the needle a rotatory motion, and moving its point in different directions; the anterior portion of the vitreous humour is at the same time disturbed. Laceration of the capsule may be too great, and allow the lens to escape entire into the anterior chamber; inflammatory action is in consequence excited, and subsides only when an opening has been made in the cornea, and the offending body extracted. If the cataract rise to its original situation on withdrawing the needle, it should be again depressed, and kept down by the instrument for a short time; and when the needle is then removed, its point should be very carefully disentangled. The lens is said frequently to regain its usual situation, a considerable time after the operation; but in many such cases, the opacity in the pupil is not occasioned by the lens, but by the capsule having become opaque. It is said to have arisen, when very solid, twenty or thirty years after depression; and that in many cases no absorption of it occurs. When the vitreous humour has become disorganised, the lens often floats about, rising and falling with the motions of the head.

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* [This expression admits of some modification. In young persons with good constitutions, whose previous health has been good, and who have not been subject to ophthalmia, I should not hesitate to operate on both eyes at the same time. In six or eight cases, in which I have lately followed this practice, no unpleasant effects whatever occurred: in all the inflammation was exceedingly moderate. — Ed.]

† [In congenital cataract there can be no valid reason for postponing the removal of the opaque lens even to as late a period as that mentioned in the text. The operation is perfectly simple, unattended with risk, and may be performed within six or eight weeks after birth. — Ed.]

In *reclination*, the point of the needle is placed on the upper and anterior surface of the lens; and by raising the handle, and pushing the point slightly forward towards the inner part of the eye, the lens is removed from the axis of vision, placed inferior to it, and has the relative situation of its surfaces changed — its anterior surface becoming the upper, and the posterior the under; the superior, posterior; and the inferior, anterior.

Solid cataracts only can be depressed or reclined. When a cataract is fluid, it is sufficient to puncture, or lacerate slightly, the anterior part of the capsule; as then the opaque contents will be diffused through the aqueous humour, and soon removed by the absorbents. Should the capsule become opaque, after the removal of its contents, the needle must be at a future period introduced; the capsule is to be lacerated and reduced to minute shreds, so that it may escape into the anterior chamber. In the soft or caseous cataract, displacement is not easily effected; and the surgeon must rest satisfied with exposing a part or the whole of it to the action of the aqueous humour.

The above operations may be had recourse to when — from diminution of the anterior chamber, adhesions of the iris, a morbid state of the pupil, and the temper of the patient — extraction cannot be attempted. When the cataract is small, it is immaterial how it is displaced; when large and solid, reclination is to be preferred. The operator is obliged to decide as to the mode of finishing the operation, after he has introduced the needle, and thereby ascertained the consistence of the cataract. If it is so soft as to permit the needle to move in all directions, it is impossible to displace it; it must be broken up, and left in situ.

In the mode of operation termed *keratonyxis*, the needle is introduced through the cornea, about two or three lines from its margin,* and the cataract is either depressed or broken up for solution. Depression through the cornea is, however, an operation not to be recommended, as the surgeon has much less command over the motion of his instrument, necessary in this form of procedure, than where it is introduced through the sclerotic coat. The pupil is previously dilated by belladonna, and the dilatation should be continued for some time afterwards. The puncture may be made at any part of the corneal circumference; it soon heals, and leaves no scar. The operation can be performed without much disturbance of the organ, and it is applicable when the cataract is soft or fluid, as in children, or its consistence doubtful. Young subjects should be placed recumbent during the operation, and rolled up in a sheet, so that they can have no command over their limbs.

Extraction, in favourable circumstances, and in dexterous hands, is a beautiful operation, and most satisfactory; but ought not to be undertaken unless the surgeon has perfect confidence in himself. It can be resorted to only in adults, great steadiness on the part of the patient being absolutely necessary. The case, too, must be judiciously chosen. The conjunctiva must be sound, and indeed almost no operation on the eye should be undertaken unless this membrane is in a healthy condition; the cornea should be transparent in every part — the anterior chamber of a proper size — the pupil regular — the iris steady, and not protruded — and the cataract solid; there should be no rolling motion of the eyeball, and no adhesions of the iris. I repeat, the iris should be steady, for a tremulous motion of it indicates disorganisation and fluidity of the vitreous humour; in such a case, the humour can with difficulty be prevented from escaping; or the lens may fall into the bottom of the eye, and all efforts to remove it will then prove abortive. And though such descent of the lens should not occur, still the organ is in a very unfavourable state for operation, being apt to become affected with deep inflammation, followed by complete amaurosis, or by closure of the pupil. The patient is prepared for the operation by moderate living, and attention to the secretions and digestive organs, for some time previously; and after the operation leeching may be necessary either as a precautionary measure, or when inflammation has occurred. Immediately before having recourse to any of the operations for cataract, a small blister may be applied with advantage behind one or both ears, and kept open for some few days, as a precautionary measure against inflammatory action in the organ operated upon.

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* [This must, I suppose, be a typographical error. The author can certainly not mean that the instrument should be introduced at the centre of the cornea, as would inevitably happen if we were to carry out his directions. The proper point is the lower and outer part of the cornea, about a line anterior to its junction with the sclerotic coat. — Ed.]

The operator is usually seated immediately before the patient, and so that his breast may be on the same level with the patient's head; if not ambidextrous, he may often be obliged to assume very awkward attitudes. The recumbent position, however, is preferred by many operators, and has the great advantage in the superior steadiness of the head of the patient. The hand of the surgeon may also be rested on the back of the couch, as, if ambidextrous, he will invariably take his position behind the patient, in order that he may have the command of the upper eyelid in his own hands. The incision is made either in the lower or upper half of the cornea. The knife should have a very keen edge, and become gradually broader and thicker, from its point backwards: in using a narrow instrument there is danger of the aqueous humour escaping. The best knife is Beer's, well made. The light must be good, the patient's head completely steadied, the eye well fixed by the fingers of the assistant, and the other one covered by a bandage. No speculum should be employed, and the pupil should not be dilated by belladonna. The surgeon, supporting his elbow on his knee, or resting his fingers on the cheek of the patient, holds the knife like a writing pen — in the right hand, if the left eye is to be operated on, in the left, if the opposite (that is to say, if he sits before his patient: if, however, he places himself behind, this must be reversed) — and ascertains the steadiness of the organ by touching the cornea gently with the side of the knife. The cornea is punctured about a line from its margin, and near the outer extremity of its transverse diameter, the point of the knife being directed towards the centre of the eye, lest it should enter between the laminæ. The knife is then passed through the anterior chamber, with its side parallel to the iris, and its point is brought out at that part of the cornea exactly opposite to where it entered: transfixion is thus completed, and by pushing the knife steadily forward, without any sawing motion, a semicircular section is effected. As soon as transfixion is accomplished, the operator has complete command of the eye, and all pressure should be taken off — the assistant should now merely keep the eyelid raised. Should the edge of the knife not come easily through the cornea, its passage may be assisted by pressure with the finger-nail.

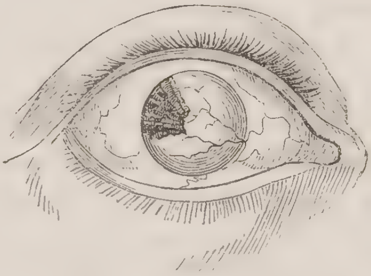
After the pupil has been allowed to dilate, by covering the eye for a few seconds with the hand, the capsule must be opened sufficiently for the escape of the lens. The eyelids are gently raised, a fine curved needle, or curette, is introduced through the incision, and by it a crucial wound is made in the capsule. The lens is then either entangled in the point of the needle and withdrawn, or very gentle pressure is made on the globe, so as to force out the lens; and, should it not readily pass through the wound of the cornea, it can be removed from the anterior chamber by a small scoop. After removal, the eye is allowed to rest; then careful examination is made; and, if any opaque substance remain, it is extracted by the needle or scoop. If the capsule is opaque, it must be taken away along with the lens. Before closing the eyelids the corneal flap should be carefully adjusted, and any matter lodged between the divided surfaces removed: loose eyelashes are to be taken away, inverted ones should be previously extracted, and the margin of the lower lid should be so placed as not to disturb the flap.

In transfixion, the point of the knife should not be brought out too low, nor too much towards the centre of the cornea; and care should be taken to avoid entanglement of the iris. When the iris falls forward so as to come under the edge of the knife, and be in danger of division should transfixion be proceeded in, pressure may be made on the cornea, so that the remaining aqueous humour may repress the iris from its untoward situation; or the knife may be withdrawn, and the operation delayed till the eye has become quiet, and the inflammation, if any, has subsided; or the incision may be completed with a blunt-pointed narrow knife, or with probe-pointed scissors. Division of the capsule by the point of the knife during transfixion has been practised; but it is an unsafe, though dexterous, measure. In opening the capsule care should be taken not to separate its attachments, otherwise it will become opaque, and thereby passage of light to the bottom of the eye will be again obstructed. Neither should much pressure be used for extrusion of the lens; for, in the case of a large and firm cataract, the iris may be lacerated, and the humours escape. When any of the vitreous humour has escaped, in consequence of its cells having been broken down, and its tenacity diminished, the eye soon fills again, but good vision is hardly to be expected.

After the operation, applications to the eye should be very light; a rag dipped in cold water, and renewed occasionally, is sufficient.

All stimulants of the organ, as light, should be avoided, and antiphlogistic treatment adopted. Should violent pain supervene, bleeding, both local and general, and other means for subduing inflammatory action, must be had recourse to. The eyelids should not be raised or exposed for at least three days, unless in extraordinary circumstances. Belladonna is of use when gradual contraction of the pupil occurs. In very favourable cases, vision is completely restored in the eye; in others, the functions of the two eyes do not correspond, and vision is confused: the patient requires to wear a convex glass before the one which has been operated on.

The operation of making an *artificial pupil* is far from being uniformly successful, and ought not to be had recourse to unless vision is entirely lost, or so much impaired as to be insufficient for the guidance of the patient's steps. It is necessary on account of central opacity of the cornea — leucoma with entanglement of the iris — and entire closure of the pupil, or diminution of it, with concealment of the remainder by corneal opacity. It may be required after badly performed extraction of a cataract, the iris being entangled in the scar of the incision, at a distance from the junction of the cornea with the sclerotic; or on account of closed pupil from inflammation, when, perhaps, the cornea is all clear. The operation is varied according to the size of the anterior chamber, the presence or absence of the crystalline lens, the extent of sound cornea, and the condition of the iris. Interference is useless when disease of the retina is suspected, from the extent of the previous disease — from violent inflammation, with or without discharge of part of the contents of the eyeball. Three distinct methods of operation are pursued.



I. Simple division of the iris, or *corotomia*, may be practised when the iris is stretched, as after extraction. It is performed by introducing a small knife, like a needle, through the anterior or posterior chamber, — the surgeon being in this regulated by the size of the anterior chamber and the presence or absence of the lens, — pushing its point through the iris, or cutting that membrane vertically, horizontally, or both, to an extent sufficient for the transmission of light. If the anterior chamber be of its natural size, a small opening may be made in the cornea with a cataract knife, or a double-edged broad and thin one; and through this opening small scissors may be introduced for division of the iris.

II. *Corectomia*, or cutting out a portion of the iris, so as to make the opening oval, square, or angular. This is performed by introducing, through an aperture in the cornea, scissors and forceps, or hooks, double or single — the latter to lay hold of the iris, the former to divide it. After the escape of the aqueous humour, a portion of the iris may be made to protrude; and, on the projecting portion being cut off, the membrane, with a proper opening in it, regains its natural situation, in consequence of discharge of the humour from behind. This operation is applicable only in few cases; the whole, or the greater part, of the cornea must be clear, and the anterior chamber not diminished in size, so that sufficient room may be afforded for the introduction of instruments between the iris and the concave surface of the cornea.

In those cases where the natural pupil remains along with a still transparent lens, while vision has been destroyed by a central opacity of the cornea, the use of sharp and pointed instruments is forbidden. Sharp hooks or scissors would endanger wound of the crystalline, and the case becoming complicated with traumatic cataract. The blunt hook, as proposed and used by Mr. Tyrrell, is here to be preferred. A small opening is made through the cornea, as the most convenient part, and the hook carefully introduced and entangled in the existing pupil: the iris is then drawn to the corneal wound, and either left entangled in the section, or removed by a pair of curved scissors. A pupil is thus formed opposite to the remaining transparent portion of the cornea.

III. *Corodialysis,* or separation of the iris from its ciliary attachments, is the method most easily performed, and most generally applicable. The eye is fixed either with the fingers or with a speculum; and a curved needle, perhaps more curved than that usually employed for cataract, is introduced either behind or before the iris, and at the upper, outer, inner, or lower part of the ball, as circumstances may require. An artificial pupil at the lower part is by much the most useful; but, if the lower part of the cornea is opaque, it must be made opposite to the inner or outer clear part. The point of the needle is entangled in the attached margin of the iris, and by raising the hand quickly, and partially withdrawing the instrument, the connexions are separated to a sufficient extent. Effusion of blood into the chamber, and to a considerable extent, follows these proceedings; and it is only after its absorption that it can be ascertained whether benefit is likely to result or not. After all these operations, inflammatory action requires to be kept down by antiphlogistic measures, abstraction of blood, purgatives, antimonials, and, perhaps, mercurial preparations. It is questionable whether belladonna can be useful in preventing closure of an artificial pupil.

Wounds of the Eyeball and its Neighbourhood.—Wounds near the eye, though unimportant in themselves, require considerable attention, on account of the eye, or its appendages, being likely to suffer in consequence. Thus, transverse wounds of the forehead or eyebrow, if their edges be not approximated accurately and soon, may cause prolapsus of the eyelids; or the eyelids may become swollen and turgid, or erysipelatous, in consequence of inflammatory action attacking the wound. When wounds of the forehead are in a perpendicular direction, their margins are easily preserved in apposition, having little tendency to retract, and there is no risk of the relative situation of the eyelids being altered. If there be considerable loss of substance in the lower part of the forehead, from the nature of the wound, when inflicted, or from its having become the seat of unhealthy suppuration, on cicatrisation of the part the eyelid will be drawn upwards, and perhaps more or less everted. There is reason to believe that a degree of blindness, and even complete amaurosis, has been caused by wound of the eyebrow, the superciliary nerve having been contused, wounded, or otherwise injured; or the functions of the eyeball may be disturbed by concussion from injury. Paralysis, also, of the levator palpebræ superioris, or of several of the muscles belonging to the eyeball, may follow injury of the forehead and neighbouring parts, from either laceration or concussion of the nerves. Wounds of the eyelids, particularly when neglected, may cause much change of relative situation in the parts, and thereby produce both inconvenience and deformity. In some instances, the relative position of the puncta lachrymalia is altered by the cicatrices of the eyelids or tarsal cartilages, when the original wound has been imperfectly adapted: hence results an incurable epiphora.

In wounds, such as those above mentioned, it is of great importance to bring the raw edges into contact, and retain them so; and, in most cases, one or more points of interrupted suture are necessary. Adhesive plaster may be at the same time applied, but of itself is insufficient to effect permanent coaptation.

Wounds of the eyeball, however slight, require much attention, being inflicted on an important and highly sensible organ, and there being always a risk of destructive inflammatory action. If the breach of surface be clean, simple, and superficial, rest of the parts will in general be sufficient to effect a cure. Lacerated wounds, and such as penetrate into the interior of the eyeball, cannot be expected to heal without morbid action having been excited: inflammation must be anxiously looked for, and actively combated as soon as it appears. When a foreign body lodges in the wound, it must be early removed. But in certain cases it is imprudent to attempt extraction of foreign matter; as when a small shot, or other minute substance, has lodged in the interior of the eyeball. In such circumstances we can only adopt such measures as prevent and subdue morbid excitement. The organ may remain little disturbed for a short period, but violent inflammatory action soon occurs, and, though subdued for a time, again breaks forth, and, by its successive attacks, may ultimately destroy the eyeball. Frequently all endeavours to avert untoward results are unavailing, and the functions of the organ are more or less impaired — the cornea may become opaque, the iris may protrude, the pupil may become irregular, contracted, or obliterated — the crystalline lens may lose its transparency, amaurosis may occur from injury of the retina, the humours may be evacuated, and the eye sink in its socket. The entrance of a large foreign body into the orbit may displace the globe, and cause it to protrude between the eyelids: in such a case the body should be removed and the ball gently replaced; vision may be soon regained; but, if the protrusion has been such as to cause much stretching of the optic nerve, blindness more or less complete remains. Fatal effects may follow wound of the eye, on account of the foreign body, as a sharp-pointed instrument, penetrating the thin parietes of the orbit, splintering the bone, and injuring the brain.

Orbital Inflammation. — Inflammation seldom attacks the parts situated between the orbit and the eyeball; but, when it does, the affection is very serious. The action is very acute, and proceeds rapidly to suppuration. The pain is excruciating, extends to the whole head, accompanied with a sensation of extreme tension in the orbit, and is much increased by the slightest motion of the eye: and from the matter accumulating around the ball, and being confined to the unyielding orbit, by the dense fibrous expansion which extends from the margin of the orbit to the interior surface of the eyeball, the globe is pushed forwards, and distends the lids. The palpebræ become erysipelatous, and swollen by serous effusion. Violent inflammatory fever occurs; and, as the disease advances, all the symptoms are aggravated, and become almost intolerable. The globe is farther protruded, and the retina is insensible to light. At length the accumulated matter makes its way to the surface, and is discharged, giving great relief to the patient, and permitting the protruded globe to regain its situation. The inflammation seldom extends to the eyeball.

In the early stage of this affection, the most decidedly antiphlogistic measures are imperiously called for. When fluctuation can be felt, or when the symptoms indicate that suppuration has taken place, whether fluctuation is perceptible or not, an early opening into the affected part should be made through the dense orbital ligament. Thus a free exit is allowed for the matter, the patient is instantaneously relieved, and the extent of the local mischief is limited. It is unsafe to wait for the spontaneous evacuation of the matter: such a process is necessarily tedious, and, before it has been accomplished, the orbital bones may have become diseased; they may have given way at certain points, and the matter may have escaped within the cranium. The artificial opening should always be free, and deep if necessary.

Tumours in the Orbit. — Sarcomatous tumours occasionally form in the cellular tissue of the orbit. They occur at all periods of life, and may, by slow and gradual increase, cause the eyeball to protrude and disturb its functions; or their growth is rapid, and accompanied with great suffering. In some cases, the eye is made to protrude to a great degree, and by the extension of the optic nerve vision is impaired; in others, the patient is totally blind at the commencement of the disease. Yet the eye may be displaced to no small extent without amaurosis following. The optic nerve appears to bear a good deal of extension without disturbance of its functions. The majority of tumours in this situation are of rapid growth, their structure is soft and medullary, they sooner or later furnish a fungus, and, though removed at an early period, are generally reproduced. The exophthalmos is often the first indication of such a growth, and it is sometimes greater in the early part of the disease than afterwards, when the fascia passing down from the edge of the orbit has given way. The malignant tumours are most frequently met with in childhood, though morbid growths of a bad kind form in the eyeball at different periods of life. They often follow the infliction of a blow or wound. The patient's sight speedily declines, without any known cause ; there is pain in the forehead, temple, and eyeball ; the ball protrudes, perhaps slightly, and at first is not otherwise changed ; but on careful examination a dimness can be perceived deep in the eye. The opaque body approaches the pupil and fills it, and may in this state be mistaken for disease of the crystalline lens ; but the tumour soon pushes forward the iris, and fills the anterior chamber. It has an irregular surface covered with flocculi. Blood-vessels are observed ramifying on it, and by this it is distinguished from cataract, should the accompanying symptoms not have previously convinced the surgeon of the nature of the disease. If not interfered with, the cornea ulcerates, a fungus appears, often grows with great rapidity, and may either furnish not a drop of blood, or bleed profusely. The eyelids are œdematous and permeated by large venous branches. Abscesses form around ; the lymphatics of the neck are involved ; and the patient succumbs. The original tumour may possess the usual structure of medullary sarcoma, may be of a melanotic nature, or may contain a mixture of both ; or it is of harder consistence, containing cells filled with bloody, glairy, or other fluid. The whole coats of the eye are seldom involved : part remains sound, but compressed and disfigured by the morbid mass, and the humours are either absorbed or discharged.

Circumscribed tumours, exterior to the ball, and surrounded by a cellular cyst, may be removed by careful and cautious dissection, without injury to the important parts. A free incision is made along the edge of the orbit, in the course of the fibres of the sphincter oculi. The tumour is exposed, laid hold of with a hook or small vulsellum, and separated from its attachments by a knife, the edge of which is directed towards the new growth. A man, aged 26, had laboured under blindness with exophthalmos for eighteen months. A tumour could be felt above the eyeball, which I dissected out, along with the lachrymal gland, to which it adhered. It was of medullo-sarcomatous structure, and of the size of a plum : at one point it contained a mass of coagulated blood. After its removal, the eye resumed its place and functions. The patient remains well ; but such favourable cases are rare.

If the affection be more extensive, it may be necessary to remove all the contents of the orbit : but, in disease involving the entire structures, there is little chance of the patient remaining free from it : it almost uniformly returns, as is also the case whenever the disease has commenced in parts of the eyeball. The optic nerve is often affected at an early period : its cut surface is unsound ; and from this, again, springs a fungus which grows rapidly. But under many circumstances the surgeon is not only justified in removing the orbital contents, but called upon to do so. The operation, though cruel and painful, need not be tedious. The commissure of the eyelids is divided with the point of a bistoury, and the fore part of the ball laid hold of firmly and deeply with a vulsellum — that is, forceps provided with a double hook at each extremity of the blades. A straight bistoury is then entered at the margin of the orbit, pushed down to the base, as near as possible to the entrance of the optic nerve, and carried round the tumour rapidly, the blade towards the handle being made to move more quickly than the point. The nerve is cut across, and, after the removal of the morbid mass, the cavity is sponged out and examined. The lachrymal gland, and other soft parts, particularly if altered in texture, are raised with a hook, and removed by means of curved scissors. In young subjects, and in adults, when the disease is far advanced, the parietes of the orbit are thin, softened, and attenuated by pressure: the knife should therefore be used cautiously, and it is, perhaps, safer to finish excision with a narrow, curved, and probe-pointed bistoury, after having penetrated to the bottom of the orbit with a sharp-pointed knife: all other curious and crooked knives are useless. Bleeding is restrained by charpie, pressed firmly and quickly into the cavity, and supported by compresses and bandage; but, before introducing the dossils, all coagula and fluid blood should be carefully sponged out. Afterwards, excited vascular action, with pain in the head and wound, may in some subjects require abstraction of blood, the exhibition of purgatives and antimonials, and immediate removal of the dressings, followed by fomentation and poultice. When matters proceeds favourably, the charpie is removed gradually as suppuration advances, and the granulations are supported with light dressing, either dry, or moistened with some slightly astringent lotion. The discharge will gradually cease, and the granulated surface cicatrise under the level of the eyelids. In such circumstances the deformity may be remedied, after the parts have become quiet, by the adaptation of an artificial eye of enamel, made so as to resemble exactly the other eye. It is worn without inconvenience, removed at night like artificial teeth or a wig, and cleaned and replaced in the morning. Such a substitute is also useful when the humours have been evacuated, or the organ destroyed, by injury or the effects of inflammation. Too frequently the morbid growth is reproduced, and that rapidly. It may be restrained by escharotics, the red oxide of mercury, potass, acetate of lead, acids, or the actual cautery; but the patient is thereby put to much pain without a chance of ultimate benefit.

It is too true, that the hopes of a cure, after the extirpation of the eyeball for malignant disease, are defeated by the prior existence of a similar affection within the cranium. In the majority of cases, death has occurred from tumours of greater or less extent, along the course of the optic nerve, or their tract: behind the commissure, and extending to the optic lobes and even cerebellum.

[STRABISMUS.

Strabismus, or squint, as it is vulgarly designated, may be defined to be an aberration from the natural direction of the optic axes, by which the consent between the eyes is destroyed, and vision more or less impaired. The resulting deformity varies in different cases, from the slightest possible cast to the most disagreeable obliquity. The affected organ may be turned inwards or outwards, upwards or downwards, according to the muscle upon the derangement of which the squint depends. When the eye is directed inwards, it constitutes what is called convergent strabismus; if, on the other hand, it inclines outwards it is said to be divergent. The upward and downward obliquities have not received any particular names. As might be supposed, these different forms of strabismus do not occur with equal frequency. On the contrary, two of them are so rare that I have not yet met with an instance, though I have examined the eyes of a very considerable number of persons labouring under this infirmity. These two forms are the upward and downward, both of which, but especially the latter, are so seldom witnessed that their occurrence may well be doubted, except as the result of external violence.

The most common variety of strabismus by far is the convergent, in which the eye is directed inwards, or inwards and upwards. Of 536 cases collected from various sources by a writer in the Philadelphia Medical Examiner, 506 were of this description, a proportion which fully accords with my own but more limited observation. The degree of obliquity may be very moderate, or so great that when the person looks directly forwards with the sound eye the cornea of the other shall be almost entirely concealed at the inner canthus. It is worthy of remark, that in this form of the lesion, at least so far as my own experience goes, the organ rarely, if ever, inclines downwards, but nearly constantly somewhat in the opposite direction.

Next in point of frequency is the divergent form, which, however, is comparatively rare. Of 866 cases reported in the work above alluded to, it was noticed only forty-four times; and thus far I have myself seen only three or four examples of it. The eye in this variety of strabismus is seldom drawn out very far, nor is it so apt to be attended with the same amount of upward obliquity as the convergent.

It seems to be the general sentiment of writers on strabismus, that, in the great majority of cases, only one organ is affected. Thus, in the article in the Philadelphia Examiner, before adverted to, it is stated that the distortion occurred 459 times in one eye, and only 47 times in both. Dr. Dix, of Boston, in a small treatise on strabismus, makes a similar remark. Of 50 cases which fell under his notice, the lesion is said to have been limited to one eye in 36. Now I am convinced from a good deal of experience that nothing can be more unfounded than this opinion, which is to be deprecated the more because it is calculated to lead to very serious errors in practice. I unhesitatingly assert, that in nearly all instances, at least of convergent squint, both organs are implicated, though not in an equal degree. Usually — perhaps always — one is more affected than the other, which the patient, therefore, regards as his good eye, as it is the one which he constantly employs in viewing objects. Nor is it surprising that this should be the case, when we recollect the remarkable sympathy existing between these structures, and the fact that when one eye is diseased the other is very liable to take on morbid action also. Amaurosis of one eye is very often followed by a similar malady of the other, and the same is true of cataract and some other affections. In the natural state there is a perfect agreement between the optic axes, produced by the harmonious action of the straight muscles, but when this consent is destroyed, as it is in strabismus, the eyes lose their parallelism, and the distortion in question is the consequence.

As was previously intimated, one eye is commonly more affected than the other, and this, if I mistake not, will be found to be the left, though it is impossible, in the existing state of the science, to indicate the proportion. Mr. Lucas thinks that the proportion in favour of the left eye is as three to two; Dr. Phillips of Leige, on the other hand, maintains that the right organ is more frequently involved than the other. It rarely happens that both eyes become deranged simultaneously; on the contrary, one generally squints first, and after a while the lesion begins in the other, the interval being probably very short.

Whether strabismus occurs with equal frequency in both sexes, is still an unsettled question. Of thirty-two cases on which I have operated, only five were females, whereas in the fifty cases published by Dr. Dix, of Boston, only nineteen were males, thus exhibiting a most remarkable disparity in reference to this point. The difference, if any, is perhaps not great either way, and, as it is of no practical importance, it need not be pursued any farther here.

The exciting causes of this affection are numerous and diversified. One of the most frequent is imitation. Nearly one-seventh of all the cases that occur are probably induced in this manner. Hence our schoolrooms may be regarded as a fruitful source of mischief, one cross-eyed child being often the cause of strabismus in many others, merely from that habit of imitation to which the young are so much addicted. Ophthalmia, by whatever cause induced, is another, and that a very common source of this distortion. I have seen repeated instances of this kind, and many others are mentioned by authors. Convulsions, eruptive diseases, such as measles and scarlet fever, hooping-cough, derangement of the digestive organs, injury on the eye, and difficult dentition, may all be enumerated as so many causes of the lesion in question. Frequently it arises without any assignable reason, and when the individual is in the most perfect health. Occasionally it is congenital, or, what is more probable, makes its appearance within a few days after birth.

It is supposed that strabismus is occasionally hereditary. This is doubtful; for if we sometimes meet with cross-eyed children whose parents, one or both, are similarly affected, it by no means proves that the distortion was transmitted to them in the manner of certain maladies. It only shows a coincidence, which may be explained, in most instances, on the assumption that the children have acquired the obliquity by imitation, or by some other cause, not that it was entailed upon them previously to birth. In the same manner we may satisfactorily account for the existence of strabismus in several members of the same family, of which a remarkable instance has recently come under my own observation. Of three brothers, one has three children affected with it, another two, and a third one. The parents have all sound eyes, and so have the uncles and aunts, except one, on whom I operated successfully several months ago.

Last autumn I operated for cataract on three children belonging to a gentleman from Mississippi, who informed me he had six others at home, of whom three were affected with strabismus. Both parents, as well as their immediate relatives, are free from the affection.

Strabismus essentially consists in a contracted state of one or more of the muscles of the eye. This, as was before intimated, is commonly the internal rectus. The shortening, varying according to the extent of the squint, is always attended with a corresponding elongation of the opposite muscle, so that it gradually loses, either in whole or in part, its antagonising influence. How this affection is brought about, in the first instance, is still unknown, though it is probable that it depends upon some lesion of the nerves which supply the muscles of the eye, rather than upon any actual lesion of these fleshy bundles themselves. Be this as it may, when the resultant distortion is permanent, the affected muscle, from being constantly engaged in holding the eye in its unnatural position, acquires a corresponding degree of development, in accordance with a law of the animal economy that, in proportion as an organ is exercised, will be its size and strength. The more frequent occurrence of convergent strabismus is owing, doubtless, to the fact that the internal straight muscle is not only larger and stronger than the others, but that it is inserted much nearer the cornea, deriving thus two important mechanical advantages.

One of the most disagreeable effects of strabismus is the deformity to which it leads, rendering the individual an object of constant observation and ridicule. Were this confined to infancy and childhood, it would be of comparatively little consequence, but when we reflect that it continues through life, and that it is a source of incessant mortification, the influence which it exerts upon the temper and disposition of the sufferer must often be of the most unhappy kind. A still more serious effect, however, is the impairment of the vision of the affected eye, which, never entirely absent, sometimes amounts nearly to a total loss, from the insensibility of the retina, which is sometimes as complete as in confirmed amaurosis. In another series of cases the person is myopic, or sees objects only at a short distance. In some instances, again, there is double vision, or objects appear indistinct, and run as it were into each other, the image painted on the retina being confused and imperfect.

The distortion in question can be remedied only by a surgical operation, it having no tendency to a spontaneous cure. On the contrary, it generally manifests a disposition to increase, particularly in children of a nervous, excitable temperament. In fact, the very worst forms of squint I have ever witnessed were in persons of this description. The question then arises, at what age ought we to operate? My opinion decidedly is the sooner the better. Provided the child be in good health, and not under one year of age, I would not hesitate a moment to resort to the knife for its relief. And why should we? The operation itself is not particularly painful, and if it be done at an early period it will commonly be necessary to perform it only on one eye, whereas if it be postponed until the age of ten or twelve, as some have suggested, we shall not be able to effect a cure without dividing the corresponding muscle of the opposite side. Moreover, the sight in the meantime will become considerably impaired, the retina will lose its insensibility, and the individual be an object of ridicule and insult; all of which may thus be obviated. But it may be urged that a resort to the knife at this tender age will be both difficult and dangerous; difficult, because of the struggles of the little patient, and dangerous, because of the great susceptibility of the nervous system. In regard to the first of these points, it may be stated that the resistance, however great, may be easily enough surmounted by proper management; and, as it respects the latter, that it has been vastly overrated. Operations much more severe are frequently performed even at a much earlier period. I have seen the primitive carotid artery successfully tied in an infant of less than six months; and I have myself repeatedly operated, with similar results, for hare-lip, and that too in the very worst forms of that malformation. I do not, therefore, in these objections, see sufficient reason for deferring the division of the affected muscle.

The instruments which I employ for the operation, are two lid-holders, a double sharp-pointed hook for fixing the eye, a pair of dissecting forceps for pinching up the conjunctiva, and a scalpel or pair of scissors. The surgeon should also be provided with two or three small sponges and a basin of cold water.

The lid-holders (Fig. 1.) are each about six inches long, made of steel with an ivory handle, quite slender, and curved at the extremity, which is fashioned after the manner of a fenestrated speculum, and not more than a third of an inch in width. These instruments may be conveniently replaced by a common speculum and the fingers of an assistant: still, they are very useful, and I prefer them to any other contrivance. The hook for fixing the ball is double (Fig. 2.), resembling that contained in some of the older eye-cases. It ought not to exceed five inches in length, and should be provided with a movable slide, to allow of the proper separation of the branches, each of which, two lines in width, terminates in a short hook as delicate as the finest needle. The forceps need not be quite the ordinary size; and, as to the scissors, the common pocket-case pair will answer the purpose much better than a curved or more delicate instrument. The knife I rarely use. A curved director (Fig. 3.) is serviceable, as it enables the operator to judge of the extent of his incisions.

In performing the operation, the patient may be either in the semi-erect or reclining posture, with his head supported by an assistant, or properly elevated by pillows. I generally prefer the latter, as the eye is more manageable, and the patient less apt to faint than when sitting. The face should look towards the light, and the sound eye be covered with a bandage, to enable the patient the better to roll the other outwards. If the surgeon be ambidexter, it does not matter where he stands: but if he uses one hand more adroitly than the other, he should place himself on the right side when he wishes to operate on the left eye; and, conversely, on the left if he wants to operate on the right. Only two assistants are necessary; one of whom, standing at the head of the patient, elevates the upper lid, and fixes the eye by inserting the sharp hook into the sclerotic coat, about two lines behind the cornea: the branches of the instrument being separated one-fourth of an inch, and the interval between them accurately corresponding with the horizontal axis of the eye. This precaution is important, and should never be neglected, otherwise it will by no means be so easy to find the affected muscle. The points of the hook should be fairly implanted into the substance of the

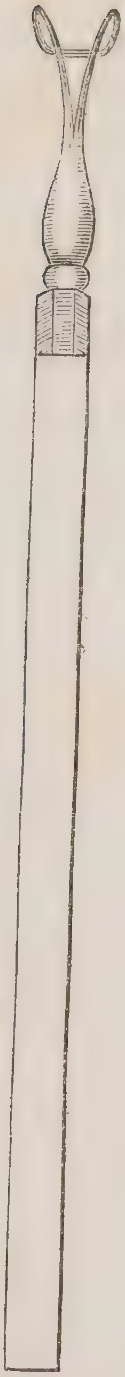


Fig. 1.

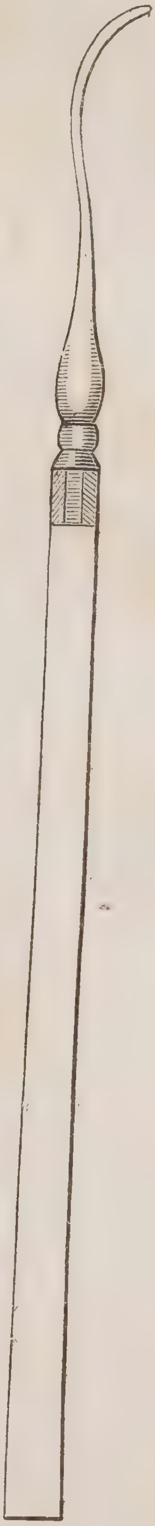


Fig. 3.

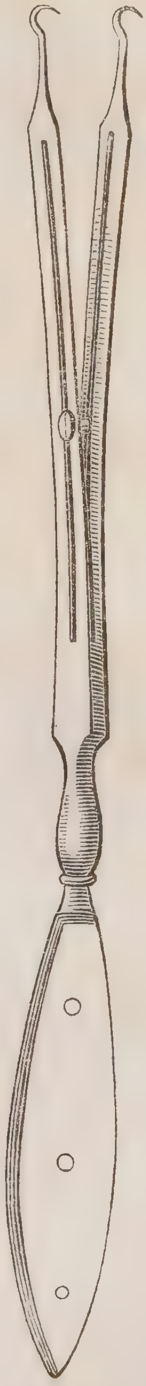
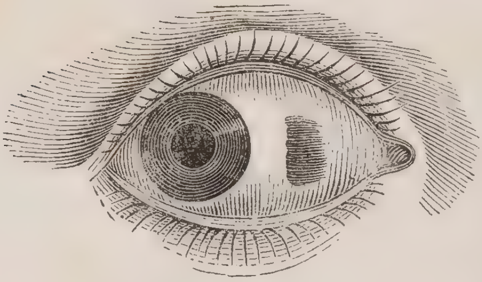


Fig. 2.

sclerotic tunic, but no more. If it be passed simply through the conjunctiva, it will be impossible to steady the eye, to say nothing of the danger of lacerating that membrane, and thus inflicting unnecessary pain upon the patient. On the other hand, if it be pushed through the fibrous coat, violent inflammation might be set up. The other assistant, placed on the side of the affected eye, depresses the lower lid, and hands the sponges to the operator. It is sometimes more convenient to let this assistant steady the eye.

Everything being thus arranged, the operator pinches up a small fold of the conjunctiva, just behind the hook, or, in other words, about three lines behind the cornea, and makes a vertical incision into it with the knife or scissors, as he may prefer. Relinquishing the forceps, the edges of the wound will at once retract, exposing thereby a surface from four to six lines in length by two or three in breadth. At this moment there is usually some degree of hemorrhage, amounting often to more than half a teaspoonful, especially if the incision has been made too far back near the semilunar valve, where the parts are always more vascular than further forward. To arrest this a small sponge, pressed out of cold water, should be repeatedly applied; or, if it prove troublesome, the operation may be suspended until it ceases. The ocular fascia[a] is next divided, when the muscle, now fairly exposed, is to be cut across with the scissors, one of the blades of which is passed behind it. The moment this is accomplished, the eye, from the force exerted upon it by the hook, springs towards the opposite side, and the muscle retracts within its sheath, especially if it has been thoroughly liberated from its connexions with the surrounding parts. To effect this, which I regard as of paramount importance, the scissors should be carried for some distance around the ball, nearly as far, indeed, as the margins of the adjacent straight muscles.



As soon as the affected muscle is divided, the eye usually at once resumes its natural position in the orbit, moving, if the other be sound, in perfect harmony with it. Occasionally, however, it retains some degree of its original obliquity; in which case it becomes necessary to reapply the instruments, to ascertain the cause of it. This will generally be found to depend upon an imperfect division of the muscle, or of the surrounding cellular tissue, by which the muscle is prevented from retracting sufficiently within its sheath. In some instances it remains without any assignable cause, but rarely beyond a few minutes, or, at farthest, a few hours.

The operation being over, the eye is bathed in cold water, to rid it of any blood that may remain in the wound, and the patient is confined in a dark apartment. Low diet should be enjoined for a few days, and, if inflammation arise, recourse must be had to antiphlogistic measures. In no case have I yet been obliged to abstract blood; a dose of aperient medicine being all that was required. Locally cold or tepid water may be used, as may be most agreeable to the patient's feelings. When there is a good deal of pain in the eye, with more or less constitutional disturbance, such as slight shivering, headache, and nausea, warm drinks and an opiate will be required. The ecchymosis which attends this operation, and which is sometimes considerable, demands no particular treatment: no inconvenience arises from it, and it commonly disappears in a few weeks. I have never known suppuration or abscess to follow the division of the muscles of the eye; such an occurrence implies unusual violence, and cannot be too much condemned. The same remark is applicable to the wounding of the sclerotic coat, and the escape of the humours of the organ; an accident which has happened several times in the hands of ignorant bunglers.

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[a] See Elements of Pathological Anatomy, vol. i., p. 489, for description of this fascia.

A few hours after the operation is completed, the margins of the incision become coated with coagulating lymph, which is sometimes effused in such quantities as to give rise to considerable pain, and a sensation like that produced by the presence of a foreign body. The vessels in the parts around are somewhat enlarged, there is more or less lachrymation, and the lids feel stiff and uncomfortable. The sclerotic coat at the bottom of the wound remains visible for five or six days, when it becomes covered with granulations, which, uniting with those at the sides, gradually fill up the gap; the whole process, from the commencement to the completion of the cicatrization, occupying from three to four weeks.

Now and then the process of cicatrization is retarded by the development of fungous granulations. When this is found to be the case, they should be snipped off with the scissors; a procedure decidedly preferable to the application of the nitrate of silver, which is not only painful but rarely effective.

It has been recommended by some surgeons that, as soon as the soreness occasioned by the operation has subsided, the patient should begin to turn his eye in a direction opposite to that in which it was held by the contracted muscle, and that these efforts should be continued daily until it regains its natural position in the orbit. In my early cases, before I had devoted much attention to the subject, I adopted and acted upon this suggestion, but the result in every instance disappointed me. Nor do I now perceive any good reason for following it, since it does not seem to me to be founded upon correct principles. Where the eye still retains some degree of obliquity after the operation, it may be positively assumed that the section of the affected muscle, or of the fasciæ by which it is invested, has been imperfect; and when this is the case it would be in vain to expect complete success. Again, the eye operated on may be entirely straight, and yet not move in concert with the other. This I have witnessed repeatedly, and hence my invariable rule is to divide at once the corresponding muscle of the opposite side, for the reason already mentioned — that the distortion generally involves both organs.

The operation for strabismus is liable to occasional failure, the principal causes of which may be thus enumerated: — 1. Imperfect section of the affected muscle, or of the ocular and submuscular fasciæ. To this subject I have already several times alluded, and it is not necessary, therefore, to offer any further remarks concerning it in this place, than to say that the operator should never neglect to divide these structures most thoroughly. In bad cases the scissors must be carried up and down as far as the contiguous straight muscles, so as to denude completely the sclerotic coat for more than one-third of its circumference. The fasciæ must be effectually raked up, otherwise it will be impossible for the muscle to retract fully within its sheath. 2. Excision of a portion of the conjunctiva, eventuating in contraction of this membrane during the process of cicatrization, may be stated as another cause of failure. As there can be no necessity for such a procedure, since it does in nowise facilitate the operation, I need hardly say that it should be studiously avoided. 3. Strabismus is sometimes complicated with other diseases, such as convulsions, epilepsy, hydrocephalus, and analogous lesions. When this is the case, the operation cannot be performed with any prospect of success, and had better be declined altogether. The existence of amaurosis does not necessarily lead to failure; if cataract be present, it should be broken or depressed either at the time of the operation or before. 4. But the most powerful cause of all, in my opinion, and one which has not been sufficiently insisted upon by writers, is the co-existence of strabismus in both eyes, and the fact that our operative procedures are usually limited to one of these organs; a circumstance at variance alike with good practice and common sense. In several instances in which only partial success attended my efforts, the whole difficulty was fairly ascribable to this cause; and so thoroughly am I persuaded of its importance, that I have laid it down as a rule never to operate on one eye only when it is certain both are affected. The only exception to this is where the patient is very young, when the section of a single muscle will sometimes, though even then not always, be sufficient. 5. A fifth cause of failure is the readherence of the posterior extremity of the muscle to an unfavourable point of the sclerotica, by which it is again enabled to exert an undue influence over the movements of the eye. The manner of obviating this occurrence has been already indicated.

The effect upon vision is at first rather disagreeable, at least in some instances. It is only by degrees that the affected organ recovers its functions, and in many cases a considerable period must necessarily elapse before this is brought about. Occasionally, in fact, the retina, from long disease or other causes, is so effectually paralysed that the sight is never restored, and it is in instances of this description that a slight return of the distortion may be looked for, however well the operation may have been executed. Another effect sometimes witnessed is double vision. This is obviously dependent upon a want of agreement between the optic axes, and rarely lasts more than a few days, unless the obliquity has been only partially remedied.

The only other effect which it is necessary to notice here, as attendant upon this operation, is a peculiar prominence of the eye. This is generally well-marked, though not equally so in all cases, and imparts to the organ a full, bold expression ; it is accompanied with a considerable separation of the lids, and is caused by the liberation of the organ from its confined situation.

The preceding remarks have special reference to convergent strabismus ; with slight modifications they are applicable to the other forms of the lesion. From the more exposed situation of the eye the outer straight muscle is much more easily approached and divided than the internal ; as to the relative facility of operating on the upper and lower, I can say very little from personal experience, but should suppose the difference, if any, to be trifling. As to the oblique muscles, I have not had occasion to divide them in a single instance, nor should I, from the knowledge I have on the subject, deem such a step necessary, it being very doubtful whether they have any agency in the production of strabismus. In several instances in which these fasciculi were divided by Lucas, Calder, and others, no impression whatever was made upon the distortion, and nearly all surgeons agree in the opinion that they should not be interfered with.

Attempts have been recently made to disparage the operation for strabismus, on the ground of the alleged tendency of the eye to return to its original malposition, or the occurrence of a new deviation. No proof, however, of such a result, founded upon an adequate number of statistical facts, has been given to the profession. In my own cases, so far as my information extends, not a single relapse has taken place where the operation was performed on both eyes, although nearly a year has expired since some of them submitted to it. Confirmatory of this, it may be stated that Dr. F. B. Dixon[a] of Norwich, England, has recently published a list of forty-one cases of convergent strabismus, in thirty-one of which, twelve months after the division of the internal rectus, both eyes were perfectly natural ; in five, where one organ alone was operated on, there was slight obliquity of the other ; in two, the squint was changed to a leer, and in three others, the eye returned to its former malposition. These results, which are in the highest degree gratifying, are sufficient to show that the operation in question, first performed by Professor Dieffenbach of Berlin, in October, 1839, deserves to be classed among the established resources of surgery, which rarely exhibits such an amount of successful terminations.]

Of Nasal Polypi. — These tumours vary in texture and disposition, as formerly stated : but the soft mucous or benign polypus is, fortunately, by much the most frequent. Generally a great many coexist in one or both nostrils, growing from different parts of the Schneiderian membrane. Sometimes there is but one tumour, of a large size ; and in some cases a large cyst, containing colourless fluid, fills the nostril. When numerous, they are in different stages of growth, and generally adhere to the membrane by a narrow neck, though sometimes several are attached by the same pedicle. It is not uncommon to remove ten or twelve polypi, or even a greater number, before the nostril is cleared. The parietes of the narrow passage betwixt the anterior and posterior nares is their most common situation, though their bases may proceed from the cells of the superior spongy bone.

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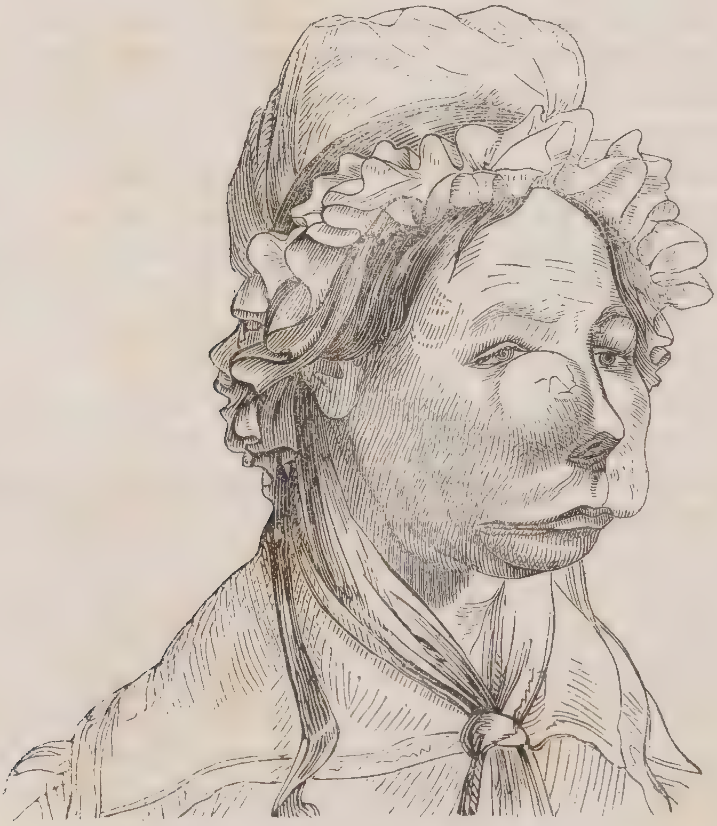
[a] Boston Medical and Surgical Journal, Dec. 29th, 1841.

The membranous covering of the inferior spongy bone, or of the anterior cavity of the nostril, is often at the same time relaxed: indeed, this of itself causes slight obstruction to the passage of air, and may be mistaken for polypus by the patient and the unexperienced. Projection of the cartilaginous septum to one side, with thickening of its covering, may also give rise to the same mistake. This formation is not uncommon, indeed it is rather frequent; and the projection is generally to the left side, with corresponding depression of the right. The circumstance may perhaps be accounted for by the pressure of the thumb overbalancing that of the fingers in the habitual practice of clearing the emunctory.

In polypus, the passage of air is obstructed, the patient feels as if labouring under a common cold — his head is stuffed: in cold and dry weather air passes through the cavity, through with difficulty; in a damp day the obstruction is complete. The tumour evidently increases, comes lower down, and even projects upon the lip. There



is watering of the eyes, the lachrymal secretions being prevented from flowing into the nostrils; and, in cases of old standing, the patient is deaf, from the pressure of the tumours on the extremities of the Eustachian tubes. This latter symptom is not constant, but depends on the position of the tumours. I recollect an old gentleman, an elder of the kirk, afflicted with nasal polypus, who for thirty years had not heard his clergyman, though for twenty of these years he had attended service regularly, and from a sense of duty. On removal of the tumours hearing was perfectly restored.

The nose changes its form, is expanded and flattened. If the disease is extensive, and particularly if the tumour is malignant, the bones are separated, the eyes are protruded, and pushed outwards; indeed, the face is so distorted as to have been compared to that of a frog. Even in the benign form, when of long duration, great deformity of the features is produced, and the patient rendered very uncomfortable. Besides the symptoms already detailed, he suffers from acute pain in the forehead — he breathes loudly and with difficulty, particularly when asleep — he has lost the sense of smell, and does not relish food or drink — and there is often profuse discharge of a dirty mucous fluid, both externally and into the pharynx.

Soft mucous polypus may exist for many years, without depressing the palate, or projecting into the fauces. The anterior nasal cavity is its most frequent seat, and it widens and fills up the fissure between the anterior and posterior cavities: frequently it projects backwards, but is not visible, though it may be felt with the finger behind the soft palate. Its growth is slow. It may become malignant, as well as other adventitious structures equally simple; but such an occurrence is extremely rare. It may exist for many years; and, when at length removed, will be found of simple structure; and, if the operation be well conducted, no reproduction will take place. The tumours are supposed to be easily regenerated; but the truth is, that they are seldom eradicated completely. In general some are left, and these, emerging from the narrow space or cells in which they were confined, soon become fully developed — they expand, and speedily take the place of those which were removed. They can never be got rid of at one sitting: the operation requires repetition once and again; and of this the patient should at the first be made aware.

Malignant Polypi are met with in different degrees of advancement. Many are firm and fibrous, with an irregular surface and wide attachment — do not grow with great rapidity— furnish a sanious and bloody discharge, and give rise to painful feelings. If interfered with, their increase is accelerated. If removed completely, reproduction may not take place.

Tumours with broad bases, and of soft medullary consistence, attended with extensive change in the structure of the membrane, and softening of the bones and cartilages, grow very rapidly, fill the cavities and expand them, giving rise to great deformity, as seen opposite. They show themselves on the face, through the nostrils — protrude through the floor of the orbit — get into the mouth behind the palate, through the tuberous processes of the superior maxillary bone — or project through the alveolar processes. The discharge from them is profuse and fetid, and in some cases blood flows in no small quantity. Such growths usually commence in one or other of the sinuses connected with the cavity of the nose — sometimes, though rarely, in the frontal sinus. When seated in the antrum maxillare, pain is experienced in the cheek for a short time before swelling occurs. Soon the part enlarges, its coverings are thickened, the bony cavity expands, and the patient's sufferings are excruciating. The teeth loosen, and sanious matter is discharged from their roots. The tumour extends into the nostril, and soon runs the course already mentioned. Malignant disease sometimes, though rarely, commences in the anterior cavity of the nostril.

No satisfactory cause can be assigned for the appearance of either the benign or malignant form of polypus.

The nostrils can be readily cleared of benign polypi, but seldom completely, as already stated, by one operation: in several cases, wherein only one or two tumours obstructed the cavities, I have had no occasion to repeat my interference. If the attachments are broad and extensive, a small curved blunt-pointed bistoury, or probe-scissors, may be employed for their separation. Sometimes the tumours can be pushed off by the finger, or by a probe with a blunt and forked extremity: then they either are blown out by the patient, or fall into the posterior cavity, thence into the pharynx, and are coughed up or swallowed. In cases such as are usually met with, forceps and a small vulsellum are the best instruments. The forceps should be about half the size of those generally used or sold by cutlers as polypus forceps. The patient is seated facing a good light and the body of the prominent tumour is laid hold of by the vulsellum; the forceps are then introduced, with the blades expanded, and carried backwards so as to reach its neck, which is then to be firmly grasped by the instrument, and gently twisted, so as to separate its connexions with the membrane. No force, no jerking or pulling, is allowable. It may happen, even with the gentlest and most careful management, that a small fragment of bone comes away along with the tumour; but this generally can or should be avoided: the cure is not rendered more certain by such an occurrence, as has been supposed. One tumour being thus detached, the same process is repeated with the others, till the cavity is cleared so far as hemorrhage or the patient's fortitude will admit. Both nostrils, if, as is usually the case, both are stuffed, may be emptied at the first sitting, so as to enable the patient to blow through them. When the tumours filling the passage to the throat have been removed, so as to allow the ready egress and ingress of air, and when the forceps can be passed along the floor of the cavity, and are expanded and shut without meeting any obstruction, examination is to be made with the finger. In those who have long laboured under the disease, the fissure between the cavities is so much expanded as to admit the little finger easily, and by it the situation of the remaining tumours is ascertained, and instruments guided to them.

After the operation the nostrils are stuffed gently with lint, to prevent the access of cold air; and, if the hemorrhage be profuse, long pieces of lint pushed well back will generally be sufficient to arrest it: if not, the posterior cavity must be plugged from behind. It is prudent to prepare for the stuffing posteriorly in bad cases in which violent hemorrhage may be expected. Instruments with springs, &c., have been contrived for the purpose, but are useless, and cannot always be had. A loop of thin flexible wire, or of thick catgut, is passed along the floor of the nostril, and on reaching the throat is caught by the finger, or by a hook or forceps, and brought into the mouth. A piece of strong thread is then attached to the wire or catgut, and the latter is withdrawn; one extremity of the thread hanging from the nostril, the other from the mouth. To the middle of the thread a piece of lint rolled up to the size of the point of the thumb is affixed, and this is pulled back into the mouth, and directed into the posterior nares with the fingers; by the pressure of these, and by pulling at the thread, the dossil is firmly wedged into the aperture. Lint is preferable to sponge, as being more easily removed; the sponge swells, and is apt to produce inconvenience. The plug must be well proportioned to the opening: if too large, it cannot be lodged in its situation; if too small, it does not fill it, and may be pulled through altogether. It should be smaller, of course, for young subjects and females than in adult males. It may be necessary to close both nostrils in this manner, when both are bleeding profusely, or when they communicate through an aperture in the septum. The anterior cavity is then closed with lint, and the hemorrhage, however violent, is completely commanded. The posterior plug is removed on the second or third day by pulling the oral extremity of the thread, and, if need be, by pressing through the nostril with a strong probe. Plugging may be required in epistaxis from other causes, when other means, as cold applied to the surface of the body, and astringent injections to the part, have failed. The latter remedy is not much to be depended upon.

The operation for polypus may be repeated when the parts have recovered, and the pain and discharge ceased. Ere then the patient again finds himself unable to propel air easily through the nostril, and, on examination, greyish, shining tumours are again visible. The same process of extraction is repeated until all are eradicated. Escharotics may be then applied with some advantage, but must be used with caution, and not of too active a nature: nitrate of silver and the red oxide of mercury are those commonly employed. But it is questionable whether these applications have any effect in preventing the future growth of the tumours.

The malignant form of the disease, even in a very early stage, is unmanageable: the tumours, if removed, are speedily reproduced, and the fatal termination may be accelerated by the interference. I have removed tumours from the antrum maxillare, and from the frontal sinus; but the parts became soon occupied by morbid growths of a more formidable character than the preceding: the membrane and bone appear to assume a disposition to generate such, and the fungous protrusions cannot be kept down with escharotics, nor with the actual cautery: nor, after free removal with cutting instruments, have escharotics, however freely applied, any effect in counteracting the inherent disposition to the disease, and preventing its recurrence.

The antrum, when filled with such tumours, is easily laid open. The cheek is divided perpendicularly from over the inferior orbitary foramen to the mouth, and the soft parts are dissected from off the bone. The cavity may then be exposed by means of a small trephine: but this instrument is scarcely ever required, the parietes being so softened as to yield easily to the knife: pliers or cutting forceps may be useful in enlarging the cavity. By the guidance of the finger, the attachments of the morbid growth are separated with a blunt-pointed bistoury; and a scoop is used to turn out the diseased mass. The root of the tumour is then touched with a red-hot iron, and by this implement, or by dossils of lint, the hemorrhage is easily arrested. But such operations, considering the result of those which have been practised, are scarcely justifiable.

It has been proposed for this disease to remove the tumour, along with its investment — to separate and dissect out the superior maxillary bone. It is a very severe operation, and one which puts the patient's life in imminent jeopardy, from profuse hemorrhage or constitutional disturbance. In one case, the surgeon began the operation after having tied the common carotid of the affected side; but, having made the incisions of the cheek and palate, was obliged to desist, on account of the violent bleeding: eight days after, the common trunk of the temporal and internal maxillary was tied on the opposite side, and the incisions repeated, but the result was the same; the growth increased, and the patent perished. The disease is very insidious in its progress, and has gained much ground before the patient becomes alarmed and applies for surgical aid. The parietes of the antrum are expanded and softened; the tumour has projected behind through the tuberous process, upwards through the plate of the orbit, or inwards to the nostril; and has contaminated by its presence and contact all the neighbouring parts. Then removal of the maxillary bone, or of all the bones in that side of the face, can be of no service. The disease is seldom if ever seen by the surgeon early enough to admit of any operation being practised with the least chance of ultimate success. At a sufficiently early period, the removal of the bone — of the parietes of the cavity containing, and from which the tumour has grown, must without doubt afford a better chance, and is, in every point of view, to be preferred to the old operation described above of what was called trephining the antrum. In one case of soft and brain-like tumour filling the antrum, and evidently commencing there, I succeeded in removing the entire disease. The patient remained sound. I have more than once seen the operation performed for this soft and malignant growth of only some months standing; portions of the bone and tumour crumbled under the fingers of the operator — the operation was harsh, painful, and appalling — the cases hopeless. Execution of the manual part is not attended with serious difficulty, and it can seldom be necessary to tie arteries previously. To expose the bone, the cheek is divided from the angle of the mouth, to the origin of the masseter, and a second incision made from the inner canthus to the edge of the upper lip near the mesial line, detaching the alæ of the nose from the maxillary bone.

The flap of the cheek thus formed is dissected up, and the nasal process of the maxillary bone and the body of the os malæ are divided with a saw, or with strong cutting pliers. An incision having been made through the covering of the hard palate, near the mesial line, a small convex-edged saw is applied to the bone; and the alveolar process is cut through by the pliers, after extraction of the middle and lateral incisors. The bone is then pulled downwards and forwards, and its remaining adhesions separated by means of the knife or pliers. This last part must be accomplished rapidly, so as to reach the vessels, and arrest the hemorrhage. During the progress of the operation, cut branches of the facial and temporal are commanded by ligature or pressure, and the violence of the hemorrhage is moderated by compression of the carotids. After removal of the bone, the deep vessels, branches of the internal maxillary, are secured either by ligature, or by firm pressure with charpie or dossils of lint. The facial flap is replaced, brought together over the charpie by which the cavity is filled, and united by interrupted or convoluted suture. Cures by such proceedings, in such cases, are reported; the patients do not always die immediately after the operation; but there is reason to complain of want of candour as regards the ultimate result.

The disease, it is said, has been arrested by ligature of the common carotid; the allegation is not borne out by facts, nor is it easy to discover on what principle the practice was adopted. Such a result is not to be expected *à priori*, nor to be believed without farther trial; and these trials are not likely to be made.

The superior maxilla is liable to become the seat of other tumours beside the preceding. It may be occupied by fibrous tumour, commencing in the bone, or in the alveoli. The tumour feels hard, and very often not encroaching upon the antrum, is evidently circumscribed, and presents a smooth and botryoidal surface. It has not that disposition to involve neighbouring parts, hard as well as soft, but may remain long without extending farther than the superior maxillary bone, and occupying only a part of it. In such a case, excision of the maxillary bone is warrantable, and ought certainly to be performed; for there is no risk of the parts being extensively contaminated. I met with one instance of it in the latter situation a good many years ago. The patient was a female, about twenty-five years of age. The tumour was of four years' duration, and its origin was attributed to a severe bruise of the cheek upon the corner of a table. The teeth had loosened soon after the injury, and the disease commenced in the gums. When she applied, there was a hard prominent swelling in the forepart of the maxillary bone, and a firm tumour involved the gums on the same side, and a part of the hard palate: the disease had made much progress during the previous six months, but had evidently none of the malignancy of the soft tumours which originate in, or early involve, the cavity of the antrum: at first it had possibly been of the nature of epulis. I removed the bone in the same way as already described, and had the satisfaction to find the disease completely taken away. The hemorrhage was restrained by compression behind the angle of the jaw during the incisions, and not more than ℥iii. of blood were lost. The tumour, when cut into, presented a homogeneous and fibrous appearance; at one or two points, softening had begun, and a small quantity of pus had been deposited. The external wound healed by the first intention, and the internal cavity granulated kindly. The patient remains perfectly free of disease, and bears little mark of so serious a disease or of so severe an operation. Within the last four or five years I have repeated the operation for this disease very often, and with uniform success. The cases are recorded in the *Medico-Chirurgical Transactions*, vol. xx., in the *Lancet*, and *Practical Surgery*, to which the reader is referred for further information on the subject. One of the tumours had attained an enormous size, and weighed nearly four pounds.

Of Inflammation, Abscess and Ulceration of the Nose, and Cavities connected with it.—Inflammation may be excited in the nose by external injury, as a bruise, or fracture, or displacement of the bones. The acute symptoms are swelling and discoloration of the integuments, turgescence of the Schneiderian membrane, which covers the septum narium and the turbinated bones, and consequent obstruction to the passage of air. Unless active measures are pursued, abscess follows, with great swelling and obstruction; and extensive loss of substance, with deformity, may ensue. Unless the acute symptoms, the short duration of them, and the rapid supervention of tumour be considered, the swelling may be mistaken for polypus.

The septum suffers more than other parts of the nose, from the concussion produced by a blow, and is in general more seriously affected by the morbid action which is induced. Matter is effused beneath the membrane, in one or both sides, usually in both, and tumours are thereby formed, which project into the cavities of the nostrils; when attentively examined, fluctuation is felt, and, if the affection has existed for a considerable time, the abscesses are found to communicate with each other, the septum having been absorbed or necrosed at one or more points. An individual received a severe blow over the extremity of the ossa nasi, and a slight wound was produced. The breathing soon became obstructed, by swelling in the nostrils, and great pain in the part was complained of. A large tumour formed on the septum, and completely filled the cavities; it was opened, and a great quantity of matter evacuated. The septum was destroyed by ulceration to a considerable extent, and a slight falling down of the middle of the nose followed. Such cases are of common occurrence.

Independently of any vice in the constitution, ulceration of the nostrils may be induced by injury, and proceed until great ravages are effected, if the treatment be not properly conducted. A young gentleman, playing at ball, was struck accidentally on the nose with the flat part of his companion's hand. Inflammation took place, externally and internally, and the passage of air was obstructed, abscess formed, and the matter was evacuated spontaneously; extensive ulceration ensued; the cartilage and bone became affected, portions of them separated, and a bloody fetid sanies flowed from the nostrils. All the cartilaginous and part of the bony septum were destroyed; the morbid action ceased after having continued for a long time; but the organ was curtailed, sunk on the face, and altogether much deformed. In this case I first proposed, and some time afterwards performed for the first time, the operation for the formation of a new columna nasi from the lip.

The alæ, as well as the septum, may suffer from external injury, indeed the whole cartilaginous part of the nose may be destroyed.

Incited action must be subdued by abstraction of blood from the external parts, or from the Schneiderian membrane, leeches being applied in sufficient numbers, and repeated. Should suppuration not be prevented, the abscess, particularly when internal, must be early opened; the surgeon is, perhaps, somewhat to blame, if the patient, having been under his care from the first, sustains any deformity. If abscess has formed on both sides of the septum, each must be opened freely; afterwards hot fomentations are to be used, and the cavity should be frequently cleansed by the injection of a bland and tepid fluid.

Intractable ulceration of the nostrils is often induced by trifling irritations or injuries in constitutions, either originally unsound, or rendered so by imprudent conduct; slight blows on the prominent part of the organ produce swelling with discoloration, and that is followed by abscess and ulceration. Internal ulceration is frequently caused by the continued use of snuff, or the presence of other irritating matters, — by irritation communicated from diseased gums or alveoli, or from decayed or crowded teeth, particularly the incisors of the upper jaw — by stumps in any part of the mouth, or the pivoting of artificial teeth on them — or by introducing the dentist's perforator, with a view of destroying the nerve of a tooth. I have seen ulceration, and loss of substance in the skin, membranes, and bones of the face, arising from each and all of these causes.

The ulceration occasionally commences, even in young subjects, in a wart or fissure on the integuments of the nose or upper lip; it thence extends to the alæ and floor of the nostrils; the cartilages, and even the bones, are destroyed; the discharge is thin, acrid, bloody, and fetid, and the action is with much difficulty controlled. The disease is met with of various degrees of severity and malignancy; it may cease spontaneously, may appear to be arrested by constitutional and local treatment, or, resisting all means employed against it, may go on consuming portions of the face, both hard and soft; destroying the nose, lips, and eyelids, and ultimately the bones in their neighbourhood. Horrid cases are occasionally met with, in which scarcely the vestige of a feature is discernible — the patient is nourished, and life is often protracted for a long period, by food conveyed over the root of the tongue, through funnels or tubes. *Noli me tangere*, and *lupus*, are names applied to the advanced stages of the disease.

Ozœna, which denotes the internal ulceration of the nose, or rather the discharge indicating such, is generally of long continuance. The discharge is at one time profuse, at another scanty; sometimes it ceases almost entirely, but the accompanying fetor, of a most disgusting nature, is still perceptible on approaching the patient, or coming within the influence of the air expired over the diseased surface; the stench is particularly offensive when portions of bone are separating. The bones may die either from inflammatory action in them running high, or from being uncovered and deprived of support by ulceration of the investing membrane. In many cases, the disease is not arrested till the cartilaginous and bony septum, the turbinated bones, the hard and soft palate, and frequently the alveoli, are completely destroyed. The patient, if he live, is in a miserable plight; — his countenance is deformed and ghastly; the situation of the nose is occupied by a large dark and foul sore; the discharge is profuse and weakening; the expired air is as a pestilence to himself and those around; speech is almost unintelligible; breathing is difficult; the strength is gradually exhausted; and the spirits sink under the harrowing impression of misery. All these ills result more frequently from the injudicious employment of mercurial preparations than from any other cause. In almost every instance, the predisposition to such frightful ulcerations has been induced by the use of mercury, and can readily be traced to it. Exposure to atmospheric changes, during or after the exhibition of mercury, may render the mucous surface and the coverings of the bones more susceptible of the disease; that medicine may be given with the utmost precaution, but for long after the constitution cannot shake off its influence; and too frequently more of the poison is administered for disease produced by it. Ulceration of the tonsils, and other parts in the fauces, often coexist with disease of the nostrils.

Ulceration of the nostrils is arrested with difficulty. It cannot be expected to cease till dead parts have separated, become loose, and fall out, or are removed by art. Portions of the bones, forming the floor of the nostril, can often be removed, when dead, through ulcerated apertures in the palate; whilst others are brought away through the nostrils, there being generally sufficient space allowed for their discharge — the nasal cavities being laid into one by destruction of the columna, and more or less of the septum. Occasionally the ossa nasi, or parts of them, escape through an opening in the superimposed integuments; sometimes they cannot be discharged otherwise, as in the following case: — Matter had come to the surface over the nasal process of the frontal bone, an incision was made for its evacuation, sequestra were found loose, and some extracted; one was pushed down with the view of pulling it through the nostril, but this was found closed from the effects of small-pox.

Various applications to the ulcerated cavities are employed. Injections of spirituous and aromatic lotions are used to wash away the discharge and correct the fetor, as diluted tincture of myrrh, or of aloes, a lotion containing a proportion of kréosote, the sulphate of zinc, solutions of the chlorides of lime or soda, &c. Applications, soothing or stimulant, are made to the exposed sores according to their appearance and disposition. When the ulcer is of an angry and irritable aspect, it is to be touched lightly with the nitrate of silver, in substance or solution, and then covered with a bread and water poultice. Fowler's solution of arsenic is useful in some cases, when the object is to clean or destroy the surface; this is also effected by a slight application of the potass. A very manageable and efficient escharotic is the chloride of zinc. It is mixed with an equal quantity of dried plaster of Paris or flour, and made into a paste, with a few drops of water for application. Black wash sometimes agrees well, as also a liniment of olive oil and lime-water, with citrine ointment (three parts of the former ingredients to one of the latter), or the sulphate of zinc lotion. When the sore is very indolent, showing no signs of granulation, it may be touched occasionally with spirit of turpentine, either pure or combined with alcohol, and afterwards covered with an ointment composed of ung. ceræ and spir. terebinthinæ; under this application ulcers often heal, after having resisted all others. But nitrate of silver applied gently, and repeated at the interval of two or three days, will, in the majority of cases, be found the most efficient remedy, combined with the simple dressing of tepid water. Constitutional treatment must not be neglected. When the disease cannot be traced to mercurial action, small doses of the bichloride of mercury are allowable when excitement is required. The arsenical solution given internally sometimes produces good effects. In foul internal disease of the nostrils with cachexia, no medicine exerts so beneficial an influence on the general health and local disease, as sarsaparilla, exhibited either in decoction, in extract, or in powder.

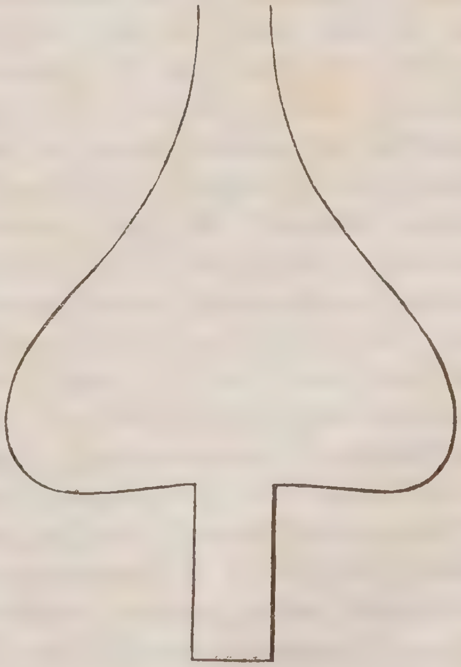
Loss of substance, from ulceration or injury, is repaired by surgical operation. A portion of integument is borrowed from some other part, and by the adhesive process is made to cover and supply the deficiency. Such operations were contrived and practised by Sicilian and Italian surgeons some centuries ago, and were revived in our day in Germany. The integument was borrowed from the upper part of the arm; it has sometimes not been applied immediately, but detached gradually, and allowed to thicken, to change its consistence, and to become more vascular, previously to its adaptation to the mutilated organ. When considered sufficiently prepared, it has been shaped so as to fit accurately, though still remaining attached at one point to the arm; the cicatrized edges of the deficient parts should then be made raw, and the new substance affixed by suture; the original attachment is preserved entire, and the patient kept in a constrained position — the arm and head being approximated and bound together by apparatus — for many days, till union occurred. Then the flap is separated entirely, and the new nose moulded into its proper form, by subsequent paring and compression.

The Rhinoplastic operation, introduced from India — where from time immemorial it has been practised by one of the castes — has superseded the preceding, and is variously modified. It is less difficult in execution, not so liable to failure, and more easily undergone by the patient. The same preparation of the flap is not required, though it is said that the Indian operators are in the habit of previously pummelling, with the heel of their slipper, the integument to be used for the new nose, so as to excite the circulation, and produce thickening; from the similarity of texture in the integument of the face, its application to the new situation is not much observed.

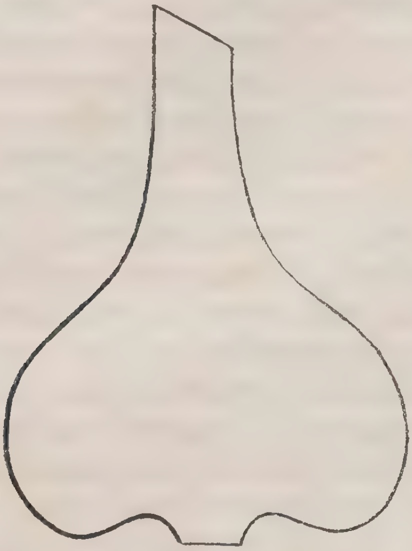
The apex and alæ can be readily repaired by a flap of proper shape and dimensions from the forehead. The cicatrized edges where the nose formerly rested, must in the first place be dissected off pretty deeply, so as to be prepared for the attachment of the new appendage. The size of the lost organ, and the dimensions necessary for its replacement, are then to be taken into consideration. It is recommended to make a mould in wax of the part, and after flattening it out, to use it as a guide for the incisions. But a piece of card or soft leather is more convenient; this having been cut of the proper size and form, is laid down on the forehead, the part representing the root of the nose resting between the eyebrows. It is held firmly by an assistant, whilst the surgeon traces its dimensions first with ink, or at once with a knife carried deeply through the integuments. The pattern is then removed, and the flap dissected down, being laid hold with the finger and thumb, or with a hook. It is then twisted round, the lower part being left undisturbed. This attachment at the root of the nose may be narrow and long, so as to admit of its being twisted, but it is not to be cut thin; it must embrace the fibres of the corrugator supercilii, so that its vascular supply may be abundant. The incision on the side opposite to which it is proposed to make the turn may be brought a little lower than the other, so as to facilitate the twisting. After bleeding has ceased, the flap is applied to its new situation, and retained in apposition with the raw edges of the truncated organ by a few points of interrupted or convoluted suture;

a little oiled lint is placed in the nostrils to support the flap, but no other dressing should be applied. To cover the part with pledgets of lint smeared with ointment, and adhesive strap, can answer no good purpose, and the subsequent removal of such must endanger the adhesion. The attention must now be directed to the wound of the forehead; the lower part is easily brought together, and retained by a stitch; thereby the whole surface is diminished, and what remains will soon be repaired by granulation. It is at first dressed merely with a pledget saturated with tepid water, afterwards some stimulating lotion may be gradually added. The operation should not be performed in very cold weather, and even in summer the patient should be enjoined not to leave his chamber. The lint may be removed in three or four days, and then, too, some of the stitches may perhaps be dispensed with. The flap will be found adherent, but loose, and raised by every expiration; very soon granulations rise from the inner surface, the part derives support from below, and becoming firm, preserves its form well. It will be necessary during the cure to keep the nostrils of their proper size and shape, by means of dossils of lint, or well-fitted tubes.

Nothing has as yet been said of the columna. In the Indian operation it is provided for by a slip purposely brought down from the forehead, and attached to the point which the root of the original columna occupied. Their flap is shaded as in the following figure. In the greater number of foreheads, an encroachment must be made on the hairy scalp, in order to obtain this part of the flap; and after bringing it down and ingrafting it into the lip, there is a risk of its not adhering, as happened in a case on which I operated now many years ago. Besides, during the healing of the internal surface, it will be difficult to prevent it from shortening, and turning inwards upon itself, and thus pulling down the apex of the nose. In the case to which I alluded, a columna was made, after consolidation of the rest of the organ, from the upper lip, as will be immediately explained; and in again performing the operation for restoration of the whole nose, I should proceed on the plan of taking only a flap sufficient for the apex and alæ from the forehead, and should borrow the columna from the lip. In this way the risk of failure will be diminished, and the form of the lip materially improved. The columna might be provided at the same time with the other parts; but it would be more advisable to delay this part of the operation till a few weeks after adhesion of the other flap has been perfected.



Since writing the preceding observations, I have in a very great many instances performed the operation according to the plan here proposed, and with the most perfect success. The form of the nasal flap was this. The little projection was made in order to be turned down, so as to form the tip of the nose ; as well as to constitute a convenient attachment for the columna, which was subsequently to be made.



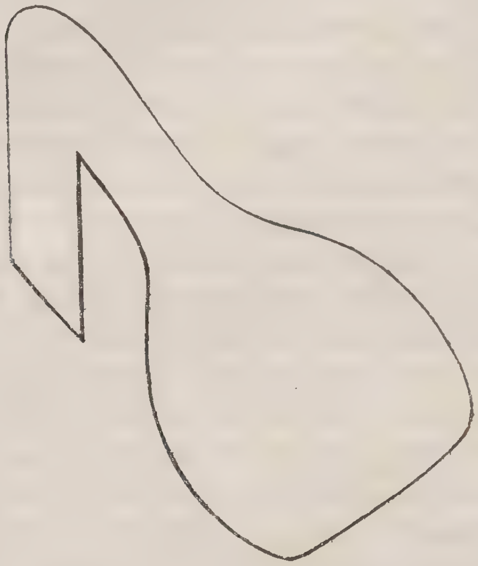
In separating the connexion with the forehead, a thin wedge-like portion is removed, and the raw surfaces, after the cessation of bleeding, are laid in apposition, and retained by gentle compression. But this should not be done till the new nose is consolidated and perfect.

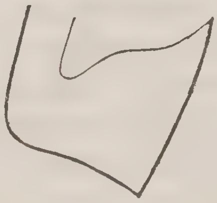
Restoration of the columna is an operation which, in this, and other civilized countries, must be even more frequently required than the restoration of the whole nose. This latter operation came to be practised in consequence of the frequency of mutilations as a punishment ; the punishment for some of our sins is left to nature, and she generally relents before the whole of the organ disappears. The column is very frequently destroyed by ulceration, a consequence, as before stated, of injury or of constitutional derangement. The deformity produced by its loss is not far short of that caused by destruction of the whole nose. Happily, after the ulceration had been checked, the part can be renewed neatly, safely, and without much suffering to the patient. The operation which I have for some years practised successfully, and in a great many instances, is thus performed : — The inner surface of the apex is first pared. A sharp-pointed bistoury is then passed through the upper lip, previously stretched and raised by an assistant, close to the ruins of the former columna, and about an eighth of an inch on one side of the mesial line. The incision is continued down, in a straight direction, to the free margin of the lip ; and a similar one, parallel to the former, is made on the opposite side of the mesial line, so as to insulate a flap composed of skin, mucous membrane, and interposed substance, about a quarter of an inch in breadth. The frænulum is then divided, and the prolabium of the flap removed. In order to fix the new columna firmly and with accuracy in its proper place, a sewing-needle — its head being covered with sealing-wax to facilitate its introduction — is passed from without through the apex of the nose, and obliquely through the extremity of the elevated flap ; the small spear-pointed hare-lip needle answers even better : a few turns of the thread suffice to approximate and retain the surfaces. It is to be observed, that the flap is not twisted round as in the operation already detailed, but simply elevated, so as to do away with the risk of failure.

Twisting is here unnecessary, for the mucous lining of the lip, forming the outer surface of the columna, readily assumes the colour and appearance of integument, after exposure for some time, as is well known. The fixing of the columna being accomplished, the edges of the lip must be neatly brought together by the twisted suture. Two needles will be found sufficient, one being passed close to the edge of the lip; and they should be introduced deeply through its substance; two-thirds, at least, of its thickness must be superficial to them. Should troublesome bleeding take place from the coronary arteries, a needle is to be passed so as to transfix their extremities. The whole cut surface is thus approximated; the vessels being compressed, bleeding is prevented; and firm union of the whole wound is secured. The ligature of silk, which is twisted round the needles, should be pretty thick and waxed; and care must be taken that it is applied smoothly. After some turns are made round the lower needle, the ends should be secured by a double knot; a second thread is then to be used for the other needle, and also secured. With a view of compressing and coaptating the edges of the interposed part of the wound, the thread may be carried from one needle to the other, and twisted round them several times; but in doing this, care must be taken not to pull them towards each other, else the object of their application will be frustrated, and the wound rendered puckered and unequal. Last of all, the points of the needles are to be cut off with pliers. No farther dressing is required; as previously remarked, no good end can be answered by any application, and the separation of dressing may afterwards be troublesome; discharges from the neighbouring passages are retained by it, fetor is produced, and union interrupted. The needles may be removed on the second or third day; their ends are cleared of coagulated blood, and, after being turned gently round on their axes, they are to be cautiously withdrawn, without disturbing the thread or the crust which has been formed about them by the serous and bloody discharge. This often remains attached for some days after removal of the needles, and forms a good protection and bond of union to the tender parts. Some care is afterwards required from the surgeon and patient in raising up the alæ, by filling them with lint, and thus compressing the pillar, so as to diminish the œdematous swelling which takes place to a greater or less degree in it, and to repress the granulations. It is besides necessary to push upwards the lower part of the column, so that it may come into its proper situation; and this is done by the application of a small round roll of linen, supported by a narrow bandage passed over it and secured behind the vertex.

Independently of the great improvement produced on the patient's appearance by the restoration of the lost part of so important a feature, it may be observed, that, when the columna has been destroyed, the lip falls down, is elongated, and becomes tumid, particularly at its middle, so that borrowing a portion from it materially ameliorates the condition of the part; the cicatrix being in the situation of the natural fossa, is scarcely observable.

The alæ of the nose, deficiencies in the upper, anterior, or lateral parts of the organ, in the forehead, &c., may be supplied from the neighbouring integument, on the same principle as the preceding repairs. In many of these operations the flap can be so contrived and cut out, as that it can be applied without its attachment being twisted. The form of such flaps is here given.



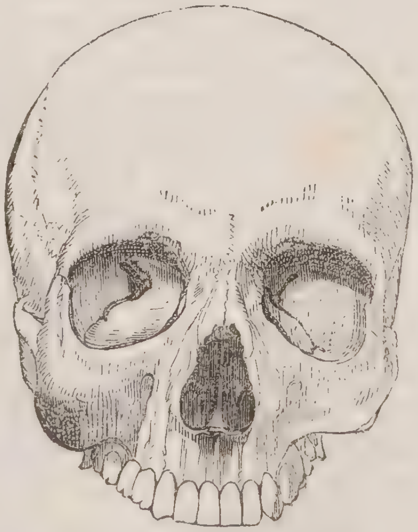


It is merely necessary to bring the portion which has been dissected from the subjacent parts of the forehead, cheek, or lip, to the part prepared for its reception, by effacing the angle betwixt it and the connecting slip. A flap to supply the greater part or even the whole of the organ may thus be transplanted.

The integuments covering the apex and alæ of the nose are sometimes opened out in texture by interstitial deposit, forming a lipomatous tumour, lobulated, discoloured, and intersected by fissures. The sebaceous follicles are enormously enlarged, so as sometimes to admit the point of a small quill. On making a section of the parts, accumulations of sebaceous or atheromatous matter are found inclosed in cysts of considerable capacity. Turgid veins ramify superficially; and the surface is of a reddish blue or a purple colour, varying its hue from time to time, according to the state of the health, and the changes in the circulation. The enlargement often attains great magnitude, producing much deformity. Vision is obstructed, and the introduction of food, both solid and liquid, interfered with: the lobes tumble into the wineglass, spoon, and cup, and sometimes they are so elongated as to require being pulled aside in order to uncover the mouth. Breathing is also impeded more or less, by encroachment on the nasal orifices. The disease may be often attributable to hard living; but many, not intemperate, labour under it.

It is desirable to have the tumour removed, even before is has become large; and it can readily be conceived that local applications must fail in bringing the skin and cellular tissue into a healthy condition. Incision is required. If both sides of the nose are affected, a small scalpel is carried down in the mesial line through the altered structure, and, whilst an assistant places his finger in the nostril, the surgeon lays hold of the integument with a sharp hook, and carefully dissects away the diseased parts, first on one side, and then on the other, so that they may correspond exactly, or present the same uniform appearance. The vessels are then tied, and sometimes a considerable number bleed smartly; oozing may continue, but is readily suppressed by continued pressure, the nostrils being well stuffed. Afterwards such dressings are to be employed as agree with the stages of the sore. After cicatrization, the comfort and appearance of the patient are much enhanced; and there is no risk of reproduction — the disease is one of the skin, and all that is affected has been removed. Sketches taken from one, of very many patients, on whom I have operated for the removal of this shocking deformity, are given in the *Practical Surgery*, p. 306–8.

Inflammation of the antrum maxillare is occasionally met with; but the surgeon is more frequently called upon to treat the consequences of this action in it. The symptoms of inflammation of the antrum are violent throbbing pain, referred to the part affected, to the temple, and to the teeth implanted in the alveolar processes that form the lower part of the cavity; the side of the face is swelled from infiltration of the soft parts, and the Schneiderian membrane of the corresponding nostril is generally observed red and swollen. The affection can frequently be traced to exposure to cold; it may be the result of external violence; but is usually an extension of disease in the sockets of decayed teeth. Unless active and early measures are taken to subdue the inflammatory attack, the antrum becomes distended by increased and vitiated discharge from its lining membrane. The swelling of the cheek becomes more apparent, since, to increased infiltration of the soft parts, enlargement of the cavity is superadded. The enlargement of the side of the face, and the bulging into the orbit are seen in the accompanying cut. The membrane covering the small aperture through which the antrum and nostril communicate partakes of the general thickening, and thus no outlet is left for the accumulating fluid. The escape of matter from the nostril, on the head being turned to the opposite side, has been laid down as an indication of accumulation or abscess in the antrum; the statement is incorrect, and is a result of surgery being professed by those who have not practised it, but judge of morbid states and their signs and symptoms by the healthy condition of parts only. In the skeleton, fluid no doubt will run over from the osseous shell, in some positions of the skull; but it cannot escape from the cavity when covered with membrane, and that membrane subject to vital actions. In short, the symptom is not observable in



the disease in question.* Extensive ulceration of the parietes of the antrum towards the nose may, perhaps, take place, as a consequence of the accumulation, and the matter may then escape by the nostril, if not allowed an exit otherwise; but such is not a common occurrence.

In general, the cavity is considerably enlarged before the matter comes to the surface. If not interfered with, it usually escapes through the sockets of decayed teeth, or, the anterior thin parietes being absorbed, it comes down by the side of the canine or small molar teeth, and is discharged slowly, so as to annoy the patient by its flavour and fetor, without the abscess being emptied, or a chance of cure afforded.

Accumulations of fluid sometimes takes place in this cavity, give rise to great enlargement of the sinus, and continue for many months, without pain or much inconvenience, and without any matter escaping. The bony parietes are attenuated, yield to slight pressure, and return to their original level with a crackling noise, such as is produced by parchment. The contained fluid is thin, greyish, and contains flocculent solid particles. In short, the antrum maxillare is occasionally the seat of chronic, as well as of acute abscess.

Cancerous ulceration sometimes takes place in the cavity; the matter is not long confined, the parietes soon soften, the teeth drop out, the alveolar processes disappear, and a large opening is formed, which furnishes a fetid, sanious discharge.

In inflammation of the antrum, carious teeth must be removed, blood must be abstracted from the neighbourhood of the affected part — leeches being applied to the gums, the Schneiderian membrane, and the integuments — and fomentations to the cheek should be frequently and assiduously employed. When the cavity has become distended with fluid — mucous, muco-purulent, or purulent — such must be evacuated without delay; and the opening must be of such size, and so situated, that the fluid may escape as soon as secreted. In removing diseased or crowded teeth opposite the part, an opening may be made from the extremities of the fangs having projected into the cavity; it is in a good situation, but cannot easily be made of sufficient size; an aperture of but small extent may be sufficient for the draining of an abscess in soft parts, but here the divided texture is unyielding, and the perforation must be free. Bad teeth are taken away with the view of abstracting a source of irritation which may give rise to, keep up, or induce a return of collection in the antrum; but extraction of sound teeth, to obtain an exit for the matter, is not warrantable. Even when they are extracted for a different reason, and discharge of matter follows, the surgeon must not be contented, but must make another and more efficient opening. The membrane of the mouth is to be divided on the forepart of the maxillary bone, immediately above the first small grinder, and a large perforator then pushed into the antral cavity; little force is required, for the parietes are soft and partially absorbed. The perforation should be of a size sufficient to admit the little finger; thereby a free and dependent exit is allowed for the concrete as well as the fluid matter. Curdy and very offensive stuff is sometimes found in great abundance in this cavity. If the discharge is very fetid, and long of drying up, and if there is an appearance of disease in the osseous parietes, injections into the cavity may be required, though seldom. They are occasionally useful in dislodging the atheromatous matter. In general the discharge gradually diminishes, the membrane of the antrum resumes its healthy condition and functions, and the aperture in its parietes is shut by a fine ligamentous substance.

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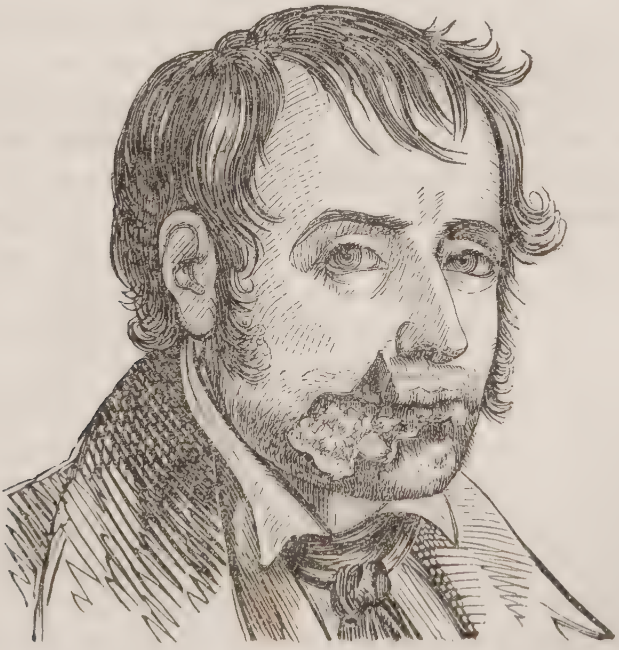
* [This opinion is certainly erroneous. That the obstruction occasionally exists in the situation adverted to, cannot be doubted, but that it does so constantly, or even generally, is not true. When the lining membrane of the antrum is inflamed, it does not follow that it must be so throughout its entire extent; most commonly, indeed, there is reason to believe that the morbid action is circumscribed, and hence when matter forms it may readily, in many cases, find its way into the nose. It is only where the whole of the mucous lining is involved, or that portion of it which covers the inner wall of the antrum, that the edges of the communicating aperture will be likely to be so much thickened as to produce complete obstruction. It is difficult to conceive how Mr. Liston could have committed such an error. — Ed.]

Ulcers of Lips. — The prolabium is liable to ulceration from various causes; from long-continued irritations, as sharp corners of teeth, rugged tartar on the external surfaces of the teeth, the habitual use of a short tobacco-pipe; from external violence; from the application of acrid matter; or from an ulcerative disposition unconnected with external circumstances. The constant and free motion of the parts is prejudicial to healing, and consequently the sores often remain long open. Though ulcers on the lips are generally of a bad cha-



racter, it does not follow that all are so. Many are simple; but these, after remaining long, are apt to degenerate. Others from the first assume malignant action, and unfortunately they are more frequently met with than simple and well-disposed sores. The malignant sore often commences in a warty excrescence which ulcerates at the base; the ulceration extends, the warty appearance is succeeded by ragged and angry fleshy points, the surrounding parts become indurated, and the stony hardness spreads. The appearance which the sore presents is that of open cancer, described at page 147, and represented on preceding page. The ulceration may either be limited in depth and extent to a small part of the lip, or may involve the greater part of the prolabium, and that without much induration. It is generally situated on the right side of the lower lip; sometimes in the angle of the mouth; the upper lip is rarely affected. I have removed a few malignant ulcers from this last situation. Sooner or later the lymphatic glands participate in the disease; a chord of indurated lymphatic vessels is felt passing over the jaw in the course of the facial artery, and the glands with which these are more immediately connected, soon enlarge and become hard. This disease, though by some pathologists said to be "improperly called cancer," differs apparently in no respect in its progress, and is in all respects as malignant as the disease commencing in any other structure and in any other way. Indurated swellings over the jaw, lymphatic or not, usually depend on the labial disease; they in some instances increase very slowly, in others acquire such volume as to induce by their pressure on neighbouring parts alarming and dangerous symptoms at an early period. Without much increase of size they sometimes attach themselves firmly to the bone, and involve it in the disease. The malignancy seems to acquire fresh virus, the skin ulcerates with fetid discharge, all the neighbourhood is speedily infected, and the patient sinks slowly under the evil.

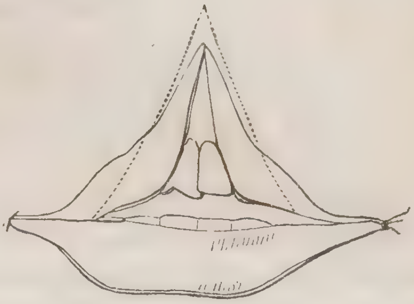
Simple ulcers of the lips may be made to heal readily, — by abstracting the exciting cause, preventing the motion of the lip by the restraint of a bandage, disusing the part as much as possible, and by employing such applications to the sore as are best suited to the character and appearance which it may present; but it must be borne in mind that all remedies can be of little service unless motion of the lip be prevented. Sores of a bad kind must be attacked early, otherwise no hope of success can be entertained. Escharotics are not to be trusted to; the knife is the only effectual means of removing the disease. When the sore does not involve much of the lip, the molar teeth having been lost, and the alveolar processes absorbed, the cheeks are thus rendered flabby and relaxed: in such circumstances, all the diseased part is taken away with facility, and the features are not thereby deformed, but rather improved. The part cut away resembles the letter V, the angle being towards the chin: this form of incision is preferable, on account of the diseased portion being chiefly in the prolabium, and the parts afterwards coming together very neatly and readily. The lip is stretched by the operator and his assistant laying hold of the prolabium on each side of the portion destined to be taken away; a narrow straight bistoury is passed through the lip, at the angle of the form of incision; and the operator, standing in front of the patient, makes the first incision towards himself, by bringing the knife up to the prolabium. He then takes hold of the part to be removed, and laying the edge of the knife on the prolabium at the other side of the induration, cuts down to the point where the instrument originally entered. The incisions must always be made far from the indurated parts. The edges of the wound are retained in apposition by means of convoluted suture, as formerly described. When the wound is extensive, as when a considerable part of the cheek is involved, approximation may be accomplished by a few points of interrupted suture, and afterwards the parts may be more securely and accurately fixed by convoluted sutures placed between the interrupted. When a large portion of the cheek is removed, as for disease which had commenced at the angle of the mouth and extended around, all the parts cannot be brought into contact, and some of the deficiency remains to be filled up by granulation. The neighbouring parts stretch, and the deformity that may be the immediate result of the operation in a great measure disappears after some time. In cases of superficial and malignant ulceration of great extent, no attempt can be made to bring the parts together after excision; great deformity, and almost total closure of the mouth, would be the consequence. The diseased parts must be freely removed (for this is the primary and essential part of the operation, all other considerations yielding to it), and the deformity will prove much slighter than might be supposed: granulations arise, and considerable reparation of the lost parts thence ensues. Still there is a risk of the sore, at first healthy and active, gradually assuming the nature of that for which the incisions were made.

It may be necessary to remove the whole lip, or the greater part of it. Hence arises much inconvenience to the patient; he is much reduced by the profuse secretion and loss of saliva; the surrounding parts are excoriated and irritable; his clothes are wetted; his speech is very indistinct; his teeth become thickly coated with tartar; and he is in short kept in a state of constant annoyance. The part may be supplied from under the chin; but this reparative operation should not be performed at the same time with the removal of the original and carcinomatous lip. By making two operations, with a considerable time intervening, the chance of success is greater, and indeed the difficulty is much diminished. After removal of the disease, allow the parts to fill up by granulation and contract as far as they will, then form a new lip. I have done so in several instances; in one case, the parts had perished by external violence; in another, they had been destroyed by some powerful escharotic. A piece of soft leather, of the size and shape of the under lip, is placed under the chin, and a corresponding portion of the integuments is reflected upwards, an attachment being left at the symphysis menti. The callous margins of the space formerly occupied by the original lip are pared; and the flap, having been twisted round, is adapted to the edges of the wound, and retained by points of interrupted or convoluted suture. To insure adhesion, the attachment at the chin should be left thick and fleshy; the flap should not consist of mere integument, but contain no small share of the subcutaneous cellular and adipose tissues, in order that circulation may be vigorous in the part. The integuments below the chin are naturally lose, and consequently the margins of the wound there are readily approximated. The flap soon becomes œdematous, and remains so for some weeks; it must be supported by a compress and bandage. After adhesion of its upper part is completed, the mental attachment, which prevented the lower portion from uniting, is to be removed; a bistoury is introduced beneath the non-adhering point, and carried down so as to divide the attachment, which is then removed by a second stroke of the knife. The lower part of the flap is now laid flat and close to the chin, and supported by a bandage. In the adult, union may be retarded by the edges of the flap twisting inwards, and interposing the hairs upon them between the opposed surfaces; when such is the case, the offending margins must be pared away. The advantages of such an operation, when successful, are too evident to require detail.

Removal of glands in the neck or beneath the jaw, that have become diseased in consequence of malignant disease in the lip, is attended with danger, and not followed by any benefit. But for this disease I have known most bloody and cruel operations undertaken,— even portions of the jaw to which the glandular tumours adhered have been cut out. Such proceedings cannot be too strongly reprobated.

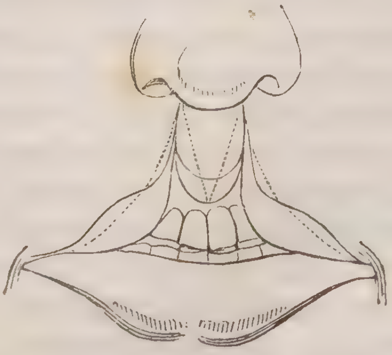
Congenital Deficiencies of Lips, Palate, &c.— Congenital deficiency of the lip uniformly occurs in the upper one; it is either simple or complicated. Frequently there is only a fissure on one side of the mesial line. This may, though seldom, be combined with division of the soft or of the hard palate; or there may be a fissure on each side of the mesial line, with an intervening flap. The flap may be either of the same length as the rest of the lip, or more or less shortened; and it may be either free, or attached to part of the alveolar process. In such cases as the latter, the central alveolar processes and teeth often project considerably beyond the arch of the hard palate, greatly increasing the deformity. The deficiency of the lip produces a disgusting and horrible deformity of the countenance; and when there is division of the palate, the voice is indistinct, or almost unintelligible.

The simple fissure of the lip, without deficiency of the palate, is easily remediable by operation. As already mentioned, the fissure is to one side of the mesial line; and its edges, covered by a continuation of the prolabium, are rounded off at their lower part. The operation is not attended with much loss of blood, nor is it very painful. It can be performed at any period of life, but in young children it is not advisable to have recourse to more severe operations on these or other parts. Children bear the loss of blood badly, and their nervous system is apt to be shaken; convulsions are induced, and often terminate fatally. The most proper age for removing deformity by operation is from two and a half to four years; there is then no danger incurred, and during the growth of the individual the parts recover more and more their natural and healthy appearance.



The operation for single harelip consists in paring off freely the edges of the fissure, and removing completely the rounded corners at the free margin, thus. This is most neatly, quickly, and easily accomplished by passing a straight bistoury through, from without inwards, so as to penetrate the membrane of the mouth, above the angle of fissure. The parts are stretched by the fingers of the surgeon or assistant, whilst the instrument is carried downwards, so as to detach a flap composed of the edge and rounded corner. Unless the rounded portions are taken clean away, an unseemly notch is left in the prolabium, where in the natural structure is prominent. A similar proceeding is followed on the opposite side. Hemorrhage is prevented by the assistant making gentle pressure whilst he stretches the lip. Two sewing needles, the heads covered with a small nodule of sealing wax, are introduced as directed after the operation for removal of diseased parts in the lower lip, and the twisted suture completed. For some years I have used pins made purposely ; they are spear-pointed and tempered near their points. From their length they can be easily inserted without being fixed in a handle, or provided with a head. One needle should always be passed close to the free margin of the lip. No further dressing is required, for reasons already assigned. The forceps of different kinds for holding the edge during its removal are worse than useless ; and paring with scissors is to be reprobated, as an effectual means of preventing immediate union. By the plan above recommended, bruising is avoided, and union takes place rapidly.

Fissures, more or less extensive, of the hard palate, generally attend double harelip. The position and size of the intermediate portion of the lip, and of the superior maxillary bone, are various ; and the operator, in forming his plan of procedure, must be guided by the state of the parts. If the fissures are not very wide — if the intermediate portion of bone, that adhering to the septum narium, is not prominent — and if the soft parts covering this are free and long, the operative procedure is simple. Two such operations as are described for single harelip, the latter performed at an interval of some weeks, are required. Thereby the intervening flap is united first to one side, and then to the other.



If the flap is short and free, without osseous projection, the operation may be concluded at once, thus :—

The edges are pared on both sides, and the parts brought together as in single harelip, the small intervening flap not preventing apposition below. One pin is passed at the prolabium, the other traverses the flap. In all cases, in fact, the operation may be concluded at once.

When the bone projects, and the flap is long, the parts may be rendered favourable for the operation by gentle and continued pressure; the osseous prominence being reduced, so as to restore the natural position of the soft parts.

When, as not unfrequently occurs, there is projection of the bone, and the soft and hard parts seem to be incorporated with the apex of the nose — when, in short, little or no intermediate flap exists, the protruding portion of bone may be removed by cutting forceps down to the level of the palatine arch; and then the soft parts can be brought together by one operation, as for single harelip.

In some cases, when the space between the palatine plates of the superior maxillary bone is wide, it may be necessary, by mechanical contrivance, fitting on metallic apparatus possessing a strong spring, to approximate the bones before attempting to unite the lip. The cases must be very rare, where the soft parts cannot be otherwise brought together: when they can be united, their equable and continued pressure will have the effect of gradually approximating the hard parts.

When the hard palate is deficient, the patient is subjected to great inconvenience from food escaping into the cavities of the nose, and, in later life, horrid wretchedness of articulation occurs. It can readily be understood, that surgery is of very little avail here. Recourse must be had to mechanical contrivance. A plate of metal (gold or platina), or a piece of ivory, or of sea-horse bone, may be fitted to the opening, and retained either by accurate adaptation, having sponge or caoutchouc attached to the upper surface, or by wires, elastic or not, resting on the neighbouring teeth. It may be made of a piece with artificial teeth, if any are required. The sponge is objectionable, as retaining the discharge, and thereby imparting an unpleasant odour to the expired air. But it is no easy matter, and often altogether impracticable, to retain such apparatus when the soft palate is also deficient. The time at which such contrivance is to be adapted may admit of some dispute. If done early in life, the natural tendency of the parts to approximate may be interfered with and subverted; if dispensed with till a later period, the patient gets into a habit of snuffling and speaking so indistinctly, that the closing of the aperture is productive of little or no improvement. Perhaps the period of commencing the child's education should be delayed till he be seven, eight, nine, or even ten years of age, and then the artificial palate may be applied advantageously in every respect.

Fissure of the soft palate is usually accompanied with separation of the bones from which it is suspended. The size of the fissure is various, and depends very much upon the state of the hard parts. In some cases, the extent of separation is great; in others, the edges are readily approximated by making the patient throw the muscles into action. The latter class admit of operation with a view to permanent union of the edges of the fissure. But it is a proceeding which, to insure success, requires not only great steadiness, coolness, and dexterity on the part of the operator, but the utmost courage, submission and self-denial on the part of the patient. These qualifications can scarcely be expected in patients under twelve or fourteen; and, consequently, the operation should not be attempted till after that time of life.

Before proceeding to operate, it should first be ascertained that the fissure is not of such extent as to prevent apposition of its edges, without great dragging of the parts; for, if the separation be wide, temporary approximation may perhaps be effected by ligatures strongly applied, but the apposition will not be complete or accurate throughout the whole fissure, and adhesion will not take place; the palate will be too much stretched, as to throw off the ligatures by ulceration at the transfixed points of its margins. The patient must be made aware of the nicety of the operation, of the responsibility that rests upon himself, and be exhorted to steadiness and patience. A single exclamation of pain may subvert the whole proceedings. He is seated opposite to a strong light, and made to open the mouth wide; if necessary, the jaws may be kept separate by a wooden wedge, placed so as not to interfere with the operator. The head is thrown back, and held steadily by an assistant. The operator depresses the tongue by the forefinger of the left hand. A long, narrow, sharp-pointed bistoury is passed through the velum, close to its attachment with the palatine plate, and about a sixteenth part of an inch from the edge of the fissure: it is then carried downwards to the point of the uvula, so as to detach a narrow slip from the whole edge. The same is done on the opposite side of the fissure during the proceeding, and to facilitate it the point of the uvula on each side may be held by long and properly pointed forceps. After allowing the patient a short rest, the coagula and mucus are cleaned away from the parts, to prepare for union. Long bent needles, in fixed handles, and armed, are passed through the pared edges on each side. On one side the ligature is thin, the opposite thick and strong; the former is attached to the loop of the latter, and withdrawn, leaving the strong ligature passed through both apertures; and by this the margins are gradually approximated, and retained by a firm knot. A second point of suture, and a third, if necessary, is applied in the same way, and as represented in the "Practical Surgery," p. 558. Or a single short curved needle may be used. It is introduced by means of a portaiguille, with a long handle, and passed through, first from the outside of one edge, and then from the inside of the other. A ligature, either of thread or of pewter wire, can thus be conveyed at once; if the latter is employed, it is secured by twisting, and the ends cut off by pliers; the needle is attached to the wire by a female screw in its end. It is advisable to make incisions in the direction of the fissure on each side, through the mucous lining, in order to take off the strain from the stitches.

Afterwards, success depends on the patient. All attempts at articulation, and even deglutition, must be strictly forbidden for three, four, or five days.

Inflammation of the Soft Palate, Uvula, and Tonsils, requires in general little surgical treatment. Reiterated attacks may sometimes be traced to the progress of a wisdom-tooth, or to the presence of stumps in the posterior part of the upper or lower jaw. Perhaps the most common cause is sudden suppression of the discharges from the skin, and from the adjoining mucous surfaces, in consequence of exposure to cold. The affection is accompanied with pain and difficulty in swallowing, and frequent and difficult excretion of mucus. The secretion of the saliva is increased, the attempts to swallow it are frequent, and the inflamed parts being thereby put in motion, the pain is aggravated. From the inflammatory action extending along the Eustachian tube, the patient describes the pain as shooting towards the ear. The parts are red, and soon becomes swollen; in some cases to so great an extent, as completely to prevent deglutition; occasionally the breathing is impeded; but the inflammatory swelling must be very great indeed, to obstruct the openings into both mouth and nostrils, and thereby threaten suffocation. The voice is hoarse, croaking, and husky; and, when the swelling is considerable, the patient speaks only in a whisper. The internal swelling is often accompanied by an external painful tumour of the lymphatic glands, and the pain is much increased by external pressure. There is more or less concomitant fever, preceded by slight shivering.

Removal of the local cause, and mild antiphlogistic measures, are usually sufficient to effect resolution, and put a stop to the disease. General bleeding will seldom be required; blood is abstracted locally, either by scarifying the internal surface, or by applying leeches at the angle of the jaw. Fomentations afford much relief, and may be applied either externally, or internally by inhalation of the steam of water, or of water and vinegar. The greatest benefit is experienced from this remedy during the early stage, it being then employed either to promote salutary effusion and effect resolution, or at a later period to forward the secretion of purulent matter. At the same time, antimonials, purgatives, warm drinks, diaphoretics, and the pediluvium, are not to be neglected. In the relaxed state of the parts, after subsidence of the violent symptoms, stimulating and astringent gargles may be used with advantage.

But in neglected cases, or those originally violent, suppuration, sometimes extensive and dangerous, occurs in the cellular tissue, betwixt the pillars of the soft palate, or betwixt the layers of the velum. The swelling thereby formed may be so large as to impede the passage of air by both the mouth and nostrils. The mouth is opened with difficulty and pain; deglutition is seriously impeded, or altogether impracticable; the voice is weak and indistinct; and the countenance is swollen and discoloured. Life is endangered by the risk of the purulent matter bursting out suddenly during the painful and laborious efforts at respiration, and escaping into the air passages; fatal results have thus taken place, and to prevent such the abscess should be opened early. When the swelling is large, and attended with alarming symptoms, the matter is most conveniently evacuated by a flat and long trocar and canula. If the abscess be small, and the breathing not affected, there will be no danger in allowing the collection to burst spontaneously. Suppuration may also occur in the external glandular tumour, or in the surrounding cellular tissue. When sloughing to any extent takes place, it is in patients of an extremely debilitated habit of body, or when the affection is attendant on disease of a malignant character. Metastasis may take place to the larynx, to the trachea, or to the lungs, either spontaneously, or in consequence of repellent applications.

Chronic abscesses are occasionally met with in these parts, or behind the upper part of the pharynx, unconnected with disease of the subjacent bones. The matter must be evacuated as soon as its existence is ascertained. No great accumulation should be allowed to take place in any situation, far less in the immediate neighbourhood of important parts.*

Scarification of the tonsils and surrounding membrane is seldom required. A lancet concealed in a canula, with a spiral spring to withdraw its point, is used for this purpose, and for opening abscesses; but dangerous and fatal results may ensue, and have actually followed such incisions of these parts. A sharp instrument directed outwards, made to penetrate either by the rash thrust of an ignorant and careless practitioner, or by a hurried movement of an unsteady patient, may reach the common trunk of the temporal and internal maxillary arteries, or even the internal carotid. The sheathed lancet may be useful in the hands of such as are not habituated to the use of instruments; but scarification of the parts and puncturing of abscesses can be effected safely by a straight, sharp-pointed bistoury, covered with a slip of lint to within three-quarters of an inch of its point. The patient's head is steadied by an assistant, the point of the instrument directed backwards, not at all outwards, and its edge upwards so as to avoid wounding the tongue, which is also to be kept out of the way by the forefinger of the left hand.

New formations about the isthmus faucium are rarely met with. Small warty excrescences, and small pendulous, fatty, or polypous tumours, are occasionally seen. These, if productive of inconvenience, can be easily removed by cutting instruments.

Enlargements of the uvala and tonsils are common, impeding deglutition, and producing indistinct and burring articulation. If large, respiration is interfered with.

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* [These abscesses are sometimes acute, the suppuration occurring as a consequence of active inflammation. They are seated in the submucous cellular substance, and often acquire a large size; at first there is merely soreness in the throat and pain in swallowing, but when matter begins to be poured out difficulty of breathing is superadded, from the pressure which it exerts upon the epiglottis and mouth of the larynx, and if it be not speedily evacuated the patient may die from suffocation. As soon as fluctuation is recognised, or even before, if there be much swelling and difficulty of respiration, relief should be afforded by a free incision, made with a sharp-pointed bistoury with the back towards the tongue, which is to be depressed with the forefinger of the left hand. — Ed.]

Elongation and Enlargement of the Uvula attends inflammatory attacks in the fauces, but may continue for a long time afterwards. The organ is increased in volume, both in length and in breadth, from insterstitial deposition of new organised substance, and from unusual vascularity. The inconvenient size produces nausea and cough; it is even said that the tumour has, in some instances, got entangled in the rima glottidis, suffocating the patient, or at least giving rise to the most alarming symptoms. In some cases the elongation appears to have kept up cough and expectoration for months or years.

The parts may be touched with a bit of sponge, dipped in the tinct. muriatis ferri; but a more useful remedy is the powder of alum, applied either on a spatula, or by insufflation. Astringent decoctions, or solutions, are of little use. But in cases of large and long continued enlargements, the swelling cannot be expected to subside under such treatment, and recourse must be had to curtailment by cutting instruments, of which the best for this purpose are long blunt-pointed scissors and forceps, with hooked points. The patient is made to open his mouth wide; the surgeon then introduces the instruments into the mouth, and watching an opportunity when the uvula is nearly stationary, suddenly seizes and clips off a sufficient portion. This is followed by instant relief.

Frequently an œdematous swelling of the uvula, of a crystalline appearance, resembling a large grape, accompanies ulceration in the neighbourhood; puncturing of the part, and attention to the cause of the affection, are sufficient for the cure. When the bloodvessels of the uvula are in a state of chronic enlargement, scarification is also employed with advantage.

Chronic Enlargement of the Tonsils occasionally takes place in children, but generally in persons from eighteen to twenty-four years of age, or in such adults as are subject to irritations in the neighbourhood of the organs. A delicacy of constitution is supposed to be indicated by the affection. One or both tonsils may be enlarged, usually both. The surface of the tumour is irregular; the mucous follicles are enlarged, and often filled with sebaceous matter. The swellings in each side gradually approach each other, meet, and by narrowing the isthmus, seriously interfere with the functions of the parts. Little pain is felt, and that is dull, occasionally shooting through the ear. Respiration is at all times fettered, and during sleep noisy. Occasionally the swellings exceed their usual size, from some accidental excitement of the circulation. They may subside very considerably on the removal of the cause, or abatement of its operation, for there is nothing malignant in their nature. It is true, as I have seen, that the tonsils may be involved in malignant disease spreading from the neighbouring parts; but in the affection under consideration, no mark of malignancy appears, as far as I know. There is mere enlargement and opening out of the texture, without much, if any, change in structure or consistence; the part may be cut into without the risk of exciting unhealthy action, and the divided surface cicatrises readily.

Deobstruents, and iodine, as the most efficient, may be given, with perhaps some effect. In the adult, when the affection is troublesome, permanent, and of long duration, the exuberant matter must be removed, and this is accomplished either by ligature or by incision. The former method is the more difficult, tedious, painful, inconvenient, and dangerous. It is seldom that one ligature, with a simple noose, suffices; it is necessary to transfix the tumour, and, separating the portions of the ligature, to include the upper and under halves in distinct nooses. The latter method is the preferable. It is not requisite to cut out the whole tonsil, and there is risk in attempting such a measure, but that part only is removed which projects beyond the arches of the palate and the natural level of the gland. Long curved scissors may be employed, but the straight probe-pointed bistoury is more convenient; and this, to insure security, may be blunted to within an inch and a half of its point, or rolled so far in lint. To facilitate incision, the tumour is laid hold of by a sharp hook, or, what is better, by a vulsellum. Occasionally violent attempts at retching occur during the operation; but there is little pain or hemorrhage. The complicated machines invented for this purpose are worse than useless. The healing of the sore is hastened by fomentations and mild gargles, and by either stimulating or soothing applications, as circumstances require.

Excision of the tonsils is said to produce the bad effect of changing the pitch of the voice — taking from the high, and adding to the low notes. I have performed the operation, as above described, on professional vocalists, to remedy indistinctness of articulation and constant hoarseness, with the desired effect, and without altering either the pitch, quality, or compass of the voice. No doubt, unpleasant results might follow extensive incisions of the parts, as division of the anterior fold of the palate, and removal of the whole tonsil; but by paring off the prominent parts of the glands no risk is incurred.

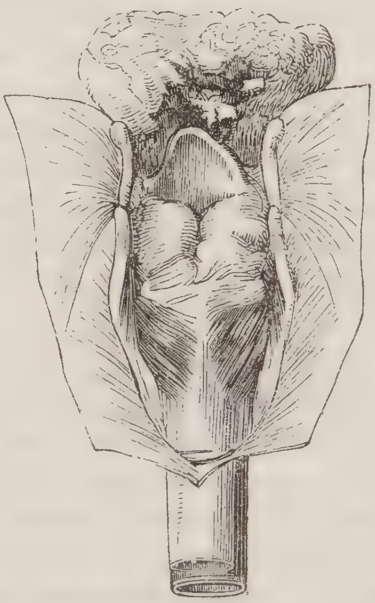
Ulcers of the Palate, &c., are said to have arisen almost uniformly from contamination of the system, following sores on the genital organs. Now, at least, they seldom and scarcely ever occur from this cause, unless most execrable practice has been resorted to. Foul and extensive ulcers of the membrane of the mouth, of the tongue, of the gums, and of the folds of the palate, are common in those who have used mercury recently; and those whose constitutions have been saturated with mercury, or who have taken only alterative doses for a considerable time, are for a long while liable to ulcerations of these parts on exposure to moisture and cold — one set of sores healing, but others soon breaking out. It is, indeed, very rare to meet with sores in these situations that are not thus accounted for: certainly such as are by recurrence deep, extensive, and troublesome, are not seen unless in those who have suffered from mercurial medicines. Slight excoriations are not uncommon in individuals of the soundest and most untainted systems; but even in very young subjects, if the sore is of considerable size, and slow in healing, it will generally be found that some preparation of mercury, probably calomel, had been given previously, and perhaps without precaution and care. Calomel, as well as other forms of the mineral, is too often and too freely given, and without proper consideration; the ruin of many good constitutions is attributable to this cause, and to this cause alone. How long mercurial poisons continue to exercise a prejudicial influence on the constitution, is a question not easily determined. In many, its dominion is long and powerful. Frequently its effects are developed years after its exhibition, from accidental circumstances, such as change in the mode of living, derangement of the stomach and its appendages, exposure to inclement weather, change of climate, &c.

Sores form in various situations, between the pillars of the fauces — in the site of the tonsils — on the uvula, and by its side — on the posterior and anterior surfaces of the pendulous velum; sometimes the ulceration appears to have extended from the nostrils. Often the uvula is entirely lost; it is not long since I saw two uvulæ, in one day, as black as a bit of coal, surrounded by ulceration, and just about to drop away. Ulceration of the posterior surface of the velum is marked by dark redness, and swelling of the anterior. Sometimes it happens, that by deepening of the ulcers, the velum is perforated at one or more points, and the edge of the opening healing, a permanent deficiency remains. The whole of the soft palate may be destroyed, either by one extending ulceration, or by repeated attacks. When cicatrisation takes place, the posterior nares are narrowed, deformed, or even completely closed. Along with ulceration of the fauces, abscesses frequently form in the coverings of the hard palate; they are either the consequence or the cause of necrosis of part of the bone. Whatever their origin, more or less of the bone with which the matter is in contact, dies and separates; and thus openings are established between the cavities of the mouth and nostril. This is productive of great inconvenience, the patient speaks very indistinctly and, when taking food, a part of the more fluid ingesta returns by the nostrils. During the progress of the exfoliation, the breath is intolerably fetid.

Such is an outline of mercurial products in the mouth. Eruptions and ulcers on the surface of the body often accompany or follow them; and the patient gets into a bad state of health — becomes, in short, cachectic.

The state of the system must be ameliorated if possible; and chiefly by attention to the digestive organs. These may be improved by such medicines, as ipecacuan, taraxacum, gentian, rhubarb, scammony, aloes, — given in various doses and combinations, according to the circumstances of the individual case. The first two possess many of the good qualities of calomel, in regard to the biliary secretion, and leave no evils behind them. Sarsaparilla is a most important remedy, and the form of its exhibition should be varied when its effects begin to diminish. The different applications which may be made to the sores have been mentioned formerly; of them all, the nitrate of silver is the most generally useful, either in solution or in substance. It is used at intervals of two or three days, not to destroy living texture, but to diminish irritability and dispose to heal. If there be no great loss of substance, deficiency in the soft parts may be repaired by operation after the ulcerative disposition has ceased. In deficiency of the palate — during the progress of the ulceration in the bone and the parts investing it, and for some time after it has ceased — the inconvenience is lessened by filling the opening with crumb of bread softened, and made into a paste by kneading; this must be frequently renewed, otherwise it collects discharge, and becomes offensive. After cicatrization of the margins, and contraction of the opening, a metallic plate may be fitted in.

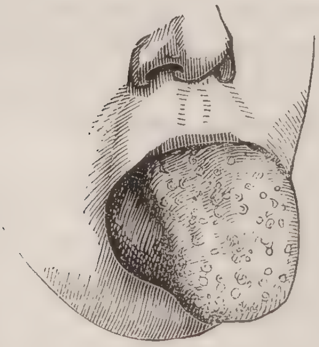
Ulcers of the Tongue. — Such as are not of a malignant kind are readily healed on improving the state of the digestive organs and general health. The state of the organ indicates that of the chylopoietic viscera, it enjoys intimate sympathy with the other parts of the alimentary canal, and why it should suffer from derangements of them is readily understood. The sores may be continued by local irritations, as by friction on encrusted tartar, or sharp or decayed portions of teeth, or by repeated application of heat, as in smoking. In consequence of long-continued irritation, like similar ulcers of the lips, they take on malignant action. The malignant ulcer generally occurs in patients past the meridian of life. Yet I have seen the greater part of the tongue involved in carcinomatous swelling in young subjects; from one girl, twelve years of age, I was obliged to remove one-half of the organ vertically. Stony induration surrounds the exposed surface to a considerable extent, and the sore presents all the characteristic appearances of cancer. In many cases the induration precedes ulceration, in others follows it. A most extensive and dreadful disease of the organ is here represented; along with induration of the whole organ, ulceration had penetrated like a tunnel from the apex to the base; œdema of the glottis supervened. Sooner or later the absorbents are affected, becoming swollen, painful, and hard; and, as in malignant affections of other parts, the disposition and action is not limited to those in the immediate neighbourhood of the primary disease. The tongue is subject to simple induration, which is totally unconnected with malignant disposition, and subsides on improvement of the digestive organs; occasionally repeated leeching of the part accelerates the cure.



Enough has already been said about removing the local irritating cause, when such can be discovered; and the maxim, though most important, need not be formally repeated in regard to affections of the tongue. The simple ulcer heals under the usual applications to sores or mucous surfaces, the general health being at the same time attended to. For malignant disease, nothing but very early removal of the part can avail. But this is not always either advisable or practicable: the disease may have involved the organ too extensively, and the lymphatics may have too widely participated in the action.

When the diseased part is small, and nothing contraindicates surgical interference, it may be removed by the bistoury; usually the bleeding is very slight, but if troublesome it is easily arrested by the cautery. When the disease is extensive, ligatures are to be employed. During the process a vulsellum is useful for grasping the morbid part, and securing the organ. The ligatures should be strong, and are introduced by needles in fixed handles. They may either be passed at once, or be preceded by finer ones, by which they are afterwards drawn through. The tongue is transfixed beyond the induration, and, if one ligature is sufficient, its noose is divided, and the parts tied separately, so as to include the mass. But frequently several ligatures are required, and their portions must be so disposed as not only to isolate all the indurated and ulcerated part, but also some of the neighbouring sound structure. They are tied firmly, to cut off vitality as completely as possible, and at once. Considerable swelling and profuse salivation follow, but gradually subside. In a short time fresh ligatures are passed through the old perforations, and drawn from time to time, till the part sloughs and drops away. This will not be found necessary if incisions are made betwixt the parts of the ligature in the first instance, so as to permit of their being tightly drawn. The swelling may be relieved by hot fomentations, and opiates mitigate the pain. The discharge is profuse and fetid. A weak solution of the chloride of soda, vinegar with honey, or a solution of the mel boracis, may be used as gargles. The healing of the wound is to be promoted by applications suited to the appearances which it may assume.

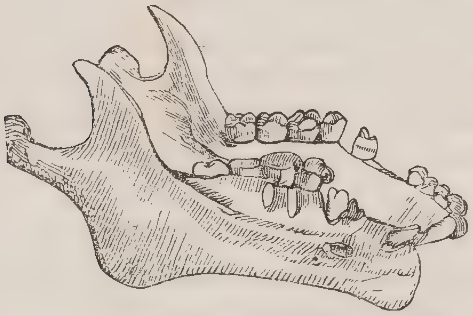
Inflammation of the Tongue occasionally occurs during certain eruptive diseases, and sometimes in consequence of accidental circumstances, as stings in the part from venomous insects; but it is not a common affection, and is generally produced by the abuse of mercury. When that poison was used more freely than now, the disease in question was by no means rare. It was then customary to see patients who were made to spit some gallons in a day, for the cure of a venereal affection, supposed or real, with their faces swollen, and their tongues protruding from their mouths, enormously enlarged. This consequence of the exhibition of mercury is more apt to occur in some constitutions than in others, and I have seen it produced in a violent form by the patient's taking only two Plummer's pills. In this case the patient, an old gentleman of broken constitution, had been filled brimful of mercury, over and over again, for one disease or another in warm climates.



The tongue swells rapidly, fills the mouth, and protrudes of a brown colour, from effused serum, with great enlargement of the papillæ. The patient is unable to speak, deglutition and respiration are much impeded, and thirst is excessive. In some instances the inflammation proceeds to suppuration, but the more general termination is resolution.

In the more mild cases, a cure will generally be procured by evacuating the bowels freely by means of saline purgatives, and by local abstraction of blood; the blood may be obtained either from the application of leeches, from opening several of the enlarged superficial veins, or from slight scarifications. Afterwards astringent lotions may be employed. But in more severe cases of glossitis, the tumour is productive of very great inconvenience to the patient, and is not unattended with danger; the difficulty in breathing may amount almost to suffocation, and in such the treatment must be active. Several free incisions are to be made longitudinally on the dorsum of the tongue; from these the effused fluids are evacuated, a considerable quantity of blood escapes, and consequently the tumour speedily subsides. Superficial incisions are not sufficient, and the practitioner should not shrink from cutting tolerably deep; for although the wounds may appear ghastly in the engorged and tumid condition of the organ, yet when the swelling subsides, and the tongue regains its usual bulk, their size, as in other situations, is so remarkably diminished, that they resemble trifling scarifications, and, in some instances, are almost imperceptible. Their extent and number must vary according to the size of the tumour, and the urgency of the concomitant symptoms. If such practice should fail in diminishing the swelling, and affording relief to the respiration, it may become necessary to perform tracheotomy. If the inflammation terminate in suppuration, the abscess must be treated on the same principles as those occurring in other parts of the body.

The tongue is also subject to gradual and permanent enlargement. A remarkable case of this nature occurred to me some years ago, and I shall here detail it shortly. The patient was a male, aged 19. The tongue was of a very large size, compressible and elastic, projected three or four inches from the lips, and completely filled the cavity of the mouth. It was of a dark brown hue, in some places livid; its surface was rough, at some points granulated, at others fissured, and at many traversed by large venous trunks. At the back part of the dorsum, the papillæ were much enlarged, granulated points were numerous, and several plexuses of dilated bloodvessels ramified immediately beneath the investing membrane. There was occasional bleeding from an ulcerated fissure near the centre of the dorsum, and also from the lateral parts of the protruded portion: in the latter situation, several cicatrices were visible. Saliva flowed in a continuous stream from the apex of the tumour. The lower jaw, much separated from the upper, was elongated and unusually narrow; the teeth, particularly those in front, were placed at a distance from each other, were covered with tartar, and projected almost horizontally from the sockets. A depression was felt at the symphysis mentis, as if the two portions of the jaw were asunder, and the intervening space occupied by ligamentous matter. The enlargement was congenital, and the organ swelled rapidly, it was stated, every three months to a much larger size, and subsided gradually. The bleeding was most frequent and profuse when the swelling was greatest, and then too he suffered much pain in the part. Articulation was very indistinct, and could be understood only by those who were accustomed to be near him. He swallowed, and even masticated pretty freely. From the periodical enlargement and diminution, from the repeated hemorrhages, and from erectile tissue being visible on many parts of the surface, I considered the structure of the tumour to be in part similar to that of aneurism by anastomosis, and to be throughout extremely vascular. I therefore did not attempt removal by incision, but in the first instance intercepted its vascular supply by tying both lingual arteries. The tumour was not affected immediately on the application of the ligatures, but soon began to diminish gradually. Everything was proceeding favourably; but, on the seventh day, the tongue was attacked with inflammatory swelling, which advanced unsubdued, notwithstanding the most active treatment. Sloughing commenced at the apex, and appeared extending backwards; I then isolated the protruded portion of the organ by ligature, and thus removed it in three or four days. At that time he complained of no pain, and felt very comfortable. But his system became much disordered soon after; abscesses formed rapidly over both wrists and on the hands, unhealthy infiltration of the cellular tissue took place at the root of the tongue, and amongst the deep muscles at the upper part of the neck, the parts became gangrenous, and he died. Dissection showed that the greater part of the tumour was composed of erectile tissue. A sketch of the lower jaw is here appended, in order to show the alteration in form, both at the symphysis and in the rami, which had resulted from the pressure of the organ and the necessarily constant open condition of the mouth.



Enlargement of the tongue occasionally takes place in young subjects, a sort of simple hypertrophy, which often proceeds to a very great extent. The increase goes on in a remarkable manner after the organ is extruded beyond the lips, so that the patient is incapable of covering it. Portions of the swelling of a V shape have been removed in such cases, and the edges of the wound put together. But by well managed and continued pressure the absorption of the swelling has been brought about, the organ has been reduced within the oral aperture, and a cure has then rapidly followed.

Division of the Frænum Linguæ is sometimes, though rarely, required. Division can be necessary only when the frænum is so short as to confine the point of the tongue, prevent free motion of the organ, and thereby cause indistinctness of articulation. Infants are often supposed by anxious mothers to have their tongues unduly confined, when no such malformation exists; in such circumstances, it is almost needless to observe that the part ought not to be interfered with. And even when there is confinement, division should not be had recourse to, unless the child is prevented from taking nourishment. The operative procedure is simple and safe. The tongue is raised towards the palate, either by a spitula or split card—or, what is better, by the fingers — and the frænum is cut across to a sufficient extent by blunt-pointed scissors.

Ranula is a swelling produced by accumulation in, and distention of, the extremity of the combined ducts of the sublingual and submaxillary glands. The extremity of the duct contracts, or is completely closed, and in consequence of the saliva and mucus (the one the secretion of the gland, the other of the duct) collect, distend the canal, and cause thickening of the parietes. Thereby a tumour is formed, which, in some instances, attains a very large size, displacing in some measure the neighbouring parts, and incommoding the tongue in particular. Indistinct utterance and impeded deglutition result.

The orifice of the duct, if discovered, is to be dilated gradually by occasional introduction of variously sized probes. Often it is necessary to make a small incision in the situation of the orifice, and introduce a bit of gum-elastic bougie, by continuing the use of which for some time, permanency of the opening may be obtained.

Deposition of Earthy Matter — principally phosphate of lime— not unfrequently takes place in the extremity of the submaxillary and sublingual ducts, and the concretion so formed is often of considerable size; some are larger than an almond. The colour is either white or yellowish, and the surface either smooth or roughened by nodules; in all the calcareous matter is friable, and disposed in concentric layers. They are of the same nature as the earthy deposits, called tartar, which form on those teeth opposite to the extremities of the salivary ducts. The foreign body produces uneasiness in the mouth, swelling, and indistinctness of speech; occasionally painful swelling of the salivary gland and surrounding parts takes place Concretions also form, though very rarely, in the extremity of the parotid duct, and are attended with like inconvenience; of this I have seen only two cases.

The foreign body is easily removed; an incision is made through the membrane of the mouth, and the concretion dislodged by forceps, a scoop, or the fingers. The saliva regains its course, and irritation subsides. Sometimes the foreign body is exposed by ulceration, and might ultimately escape from its bed spontaneously.

A figure of a salivary calculus of considerable size is here given. When the concretion is small, its extraction is not so easily accomplished as might be supposed. It is apt to slip back out of reach, so that it cannot be seized, brought forward and extracted either by scoops or forceps. The flow of saliva must be promoted by giving the patient something to masticate; the probability is, that the foreign body will

then be presented, and perhaps expelled, if the opening of the duct has been previously dilated. A young lady was brought to me lately suffering great uneasiness from the presence of a concretion, not larger than a millet-seed. She complained of great pain under the jaw on seeing anything savoury, that, as the vulgar phrase is, made her mouth water. Various unsuccessful attempts had been made to remove it. A small incision of the surface of the duct was made, but the foreign body eluded the grasp of the forceps, and completely disappeared. The patient was given a bit of bread to chew, and almost immediately the concretion was expelled.

Tumours, unconnected with the salivary ducts, occasionally form in the loose cellular tissue under the tongue. They may be either sarcomatous or encysted; the former are rare. I have removed several solid tumours, principally adipose, from this situation. They were loosely connected, and taken away without almost any dissection; indeed they were lifted out with the fingers, after division of the membrane of the mouth and of the cellular cyst which surrounded them. One was as large as an orange, and of a flattened form. The tongue had been displaced by the swelling, and articulation, deglutition, and breathing impeded. The patient, an old lady, had a good recovery. The case had been by some mistaken for ranula; and I mention this circumstance, lest others may reckon more on the situation of a swelling, than on its feel and other external characters. A sketch of the tumour is given at page 137.

Encysted tumours below the tongue are common. The cysts are generally thin and adherent, the contents albuminous and glairy. They attain a large size, and prove very inconvenient. Occasionally the cysts are thick and more loosely attached; such usually contain atheromatous matter. I removed one uncommonly large, from the inner surface of which numerous hairs were growing.

Encysted tumours here can seldom be removed by dissection; the depth of their situation, their firm connexion, the awkward situation in which the patient is necessarily placed, and the risk of hemorrhage, forbid the surgeon from attempting regular extirpation. A more simple and equally effectual procedure is as follows: — The membrane of the mouth and the cyst are divided by the point of a bistoury; and if the tumour be large, and the distention great, an oval portion of the parietes may be cut out. The contents are thus evacuated. The bleeding is allowed to cease, and the cavity having been wiped out clean, a stick of caustic potass is applied to the surface, so as to annihilate the cyst effectually. This I believe to be the only radical and safe mode of removal; after any other, the tumour is certain to be reproduced. It has been recommended to pass a seton, so as to excite inflammatory action, and lead to obliteration of the cyst. I have made trial of this practice, but most dangerous swelling ensued, the mouth was rapidly filled, and the system alarmingly shaken; after all the disease was not eradicated.

Tumours beneath the tongue, however originating, occasionally inflame, and become the seat of unhealthy abscess. A large and painful swelling forms, and projects under the chin. The matter gradually approaches the surface, and perhaps evacuates itself imperfectly into the mouth, or the integuments give way, and afford an external issue. In such cases, an early incision from the mouth may prevent the internal mischief, and the disfiguration of the countenance which would otherwise ensue may, in short, limit the suppuration; at a later period a free opening requires to be made below the chin, in the mesial line, and in the direction of the muscular fibres. A ready drain is thus obtained for the matter, and the cavity of the abscess gradually contracts.

Tumours of the Gums are usually hard, and not inclined to increase rapidly. They are of the same consistence as the parts to which they are attached, and grow either inwardly, outwardly, or both. They surround one or more teeth, which at last become loose, the alveolar processes then soften, and form part of the swelling.

These may degenerate, and grow rapidly, or the tumour may be soft (tumor mali moris) from the first. The attention of the patient is directed to the part by the occurrence of discharge from about the teeth, which loosen one after another. A soft tumour arises from the sockets after either extrusion or extraction of the teeth, it grows rapidly, and involves more and more of the gums and alveolar processes. Angry ulceration attacks the prominent parts of the swelling; the bone is softened to a considerable extent around; the discharge is thin, bloody, and profuse. Ultimately the lymphatics become affected, neighbouring parts are contaminated, malignant action acquires a firm footing, and extends, the patient becomes hectic, and dies.

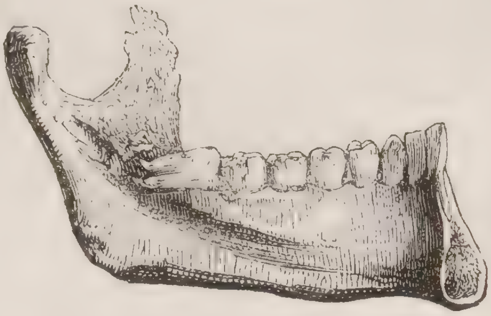
Each kind of tumour should be removed freely and early; the untoward results of the latter have been already mentioned; and I believe that, if the former be allowed to proceed unchecked, the tumour may ultimately extend to the bone, and osteosarcoma of the jaw, more or less extensive, be established. The disease must be attacked at an early period of its existence, and teeth, sockets, and soft parts taken freely away, by means of a strong knife and saw, or cutting forceps. After excision, the actual or potential cautery should be applied, otherwise the disease is apt to recur. Portions of involved bone, which may have escaped the knife, are by the caustic made to exfoliate. When the potassa fusa is used for the purpose of destroying what cannot be readily reached by the knife, and when it is pushed into the alveoli and applied to the altered gum, its action must be limited by the immediate use of vinegar, diluted or not.

Inflammation of the gums and neighbouring parts is attended with violent pain, swelling, and throbbing, difficulty in opening the mouth, headache, and fever. Inflammation of the soft parts runs its course speedily, and, as the cause is seldom removed during the existence of the inflammatory action, generally terminates in suppuration, so giving rise to what is termed *parulis* or gumboil. Frequently the inflammation extends to the sockets of the teeth, which seldom resist the action long, but from their low degree of vitality soon become necrosed; and by the presence of the dead portions of bone, a fresh accession is given to the disease. Severe pain is experienced on touching the teeth whose alveoli are affected; they project and become loose; purulent matter is secreted, and oozes out between the loosened teeth and diseased gums. Abscesses form, and point in different situations; the gums are tumid and spongy; through the openings in them the bone can be felt bare, and the purulent matter is situated within or around the alveoli, and under the mucous membrane and cellular tissue which invest them.

When the inflammation has been either intense from the first, or of long duration, it not unfrequently happens that abscesses form within the substance of the jawbone, and occasionally to a considerable extent — a portion of the bone having become inflamed, and the action terminating in suppuration and partial caries. This is more apt to occur in the inferior than in the superior maxillary bone; and, if alloyed to proceed, the osseous cyst containing the purulent matter gradually enlarges, the plates of the bone are separated and expanded, the parietes become attenuated, and the affection is termed spina ventosa. Purulent collections in this situation also seem, in many instances, to arise from, or at least to be preceded by, the formation of a cyst around the decayed root of a tooth. Such cysts are generally of small size, and pyriform shape; externally they are smooth, membranous, and of rather a delicate texture; internally, they are lined by lymph of soft consistence, and contain purulent matter. In fact, they are purulent depôts, which form in consequence of inflammation around the fangs of the teeth, and from which the matter is occasionally discharged through a small aperture at the upper part of the cyst, and by the side of the affected tooth. They sometimes attain a very considerable size.

Mercury is perhaps the most common cause of this disease; but it is also produced by certain operations on the teeth, and by the presence of carious teeth or of stumps.

Caries of the teeth is an extremely common affection, and in some instances seems to arise from an unhealthy state of the constitution; but it is most frequently produced by the teeth having suffered from chemical agents, as when the mineral acids have been taken for a considerable time as medicines, or when the individual is in the habit of consuming sweetmeats, and confections. Sometimes the disease remains almost stationary, and may give little or no annoyance for a number of years; in other instances, its progress is very rapid. A portion of the tooth gradually decays, and this is at first unattended with any uneasy sensation; but when, from continuance of the destructive process, the central cavity has been exposed, the pain is excruciating, attended with headache, and swelling of the surrounding soft parts. In general, the progress of the disease may be arrested by removing the diseased portion, and stuffing the cavity, before any pain has been felt. But after the central cavity of the tooth has been exposed, filled with fungous mass, as here seen, or from their growing in a faulty direction, and pain consequently experienced, the most effectual remedy is extraction. The patient from whom the specimen below was obtained, perished in consequence of the extensive abscesses of the mouth and neck, consequent upon the awkward position of the wisdom tooth.



From the presence of carious teeth, or decayed portions of teeth, many evils both local and general ensue, besides inflammation and abscess. They are frequently the cause — and the sole cause — of violent and continued headaches; of glandular swellings in the neck, terminating in, or combined with abscess; of inflammation and enlargement of the tonsils, either chronic or acute; of ulcerations of the tongue or lips, often assuming a malignant action from continued irritation; of painful feelings in the face, tic doloureux, pains in the tongue, jaws, &c.; of disordered stomach, from affection of the nerves, or from imperfect mastication; and of continued constitutional irritation, which may give rise to serious diseases.

Along with abscess of the gums, purulent matter often collects in the cellular tissue of the cheek or of the chin. In the latter situation, the inflammation and suppuration are often caused by the teeth in the front or side of the lower jaw being too much crowded together. When the teeth are crowded together, the patient, of course, cannot be effectually benefited till one or more of them are extracted, and sufficient space allowed for development of the others. The abscess gives way, and discharges its contents often both externally and internally, and a fistula remains, which cannot be got rid of, unless, as in most other affections, the cause be removed. The cavity of the abscess must be opened into either from without or within, and after the subsequent irritation has subsided, the cause must be removed; carious teeth or stumps are not to be taken away during the inflamed state of the parts, but after the pain and inflammation has subsided in consequence of free evacuation of the purulent matter. After these have abated, and not till then, the offending bodies are to be extracted, both in order to procure a more speedy and effectual cure, and with a view to prevent recurrence of the disease. If a portion of the jaw has become necrosed, the sequestra are to be extracted as they become loose, and openings and counter-openings must be made, according to circumstances, so as to afford a free outlet to the matter.

The extraction of teeth, the crowns of which have not been destroyed, is accomplished most readily by the dexterous use of variously shaped forceps. Stumps may be occasionally extracted also by forceps, but the lever is generally required to loosen them from their sockets. The old key instrument and pelicans are now superseded by those above mentioned.*

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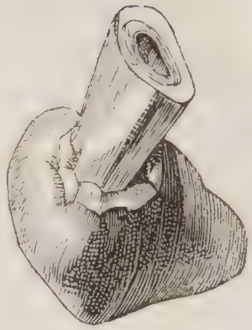
* [There is no subject of greater importance to the country practitioner than the extraction of the teeth; an operation which, from his insulated situation, he is constantly obliged to perform. Like the operation of venesection, it may be executed well or indifferently, and precisely as he does the one or the other will be the measure of his standing with his patients. The following observations in relation to this subject are condensed mainly from the excellent work of Mr. Bell, "The Anatomy, Physiology, and Diseases of the Teeth," which should be in the hands of every physician in the country.

Mr. Bell thinks that the separation of the gum from the teeth, as a preliminary measure, is unnecessary; a view in which I must entirely disagree with him. That it materially facilitates the removal of the organ from its socket, ample experience has long since convinced me. The operation may be performed with a gum-lancet, or, what I have always preferred, a sharp penknife, which should be passed completely round the neck of the tooth, down to the alveolar margin of the jawbone. In the removal of the first teeth in children the previous separation of the gum is unnecessary.

The incisors of the upper jaw will require the use only of a small pair of straight forceps, the application of which is extremely simple. As the roots of these teeth are conical, and generally perfectly round, they will require merely a slight rotation, when they may be drawn downwards in the direction of the socket. The forceps should be placed as high on the root as the alveolar process will admit, and pressed so firmly as to prevent the blades from slipping, while at the same time care is taken not to crush the tooth.

The extraction of the lower incisors is effected in a very different manner. The roots of these teeth being very much flattened laterally, it is obvious that they cannot be dislodged upon the principle of simple rotation in the socket. When the tooth is even, or nearly so, with the others on each side of it, the best instrument will be the hawk's-bill forceps, of very small size, and with narrow blades. The instrument being fixed as low on the neck of the tooth as possible, a gentle but firm movement is to be made forwards, so as just to separate the organ from the back part of the alveolar cavity, and then, continuously with this motion, the tooth is at once to be raised out of the socket.

The superior cuspid and bicuspid teeth may generally be removed by means of the same straight forceps as the incisors. The extraction of the former will be considerably facilitated, by giving a slight degree of rotation previous to its actual dislodgement from the socket. The bicuspids, on the contrary, having flatter sides, and less solid roots, will not allow of any degree of rotation; and must therefore be dislodged by first of all moving them a little outwards towards the cheek, so as to destroy the attachment to the inner alveolar plate,



Spina Ventosa of the Jaw often originates, as before mentioned, in a small cyst at the root of a decayed or dead tooth. An enormously large one extracted along with the stump attached is here shown: it is sketched from a specimen in the collection of Mr. Nasmyth, of Edinburgh.

The disease is usually situated on one side of the lower jaw; but sometimes occurs in the upper, and is at first unconnected with the cavity of the antrum. Inflammation has taken place in the internal structure of the bone; matter is secreted by the medullary vessels, and collects in the cancellated texture. Purulent formation advances, the cancelli are broken down, the external laminæ of the jaw are extended, protruded, and attenuated; and then the internal

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and then, by a perpendicular pull, they may be lifted directly from the socket.

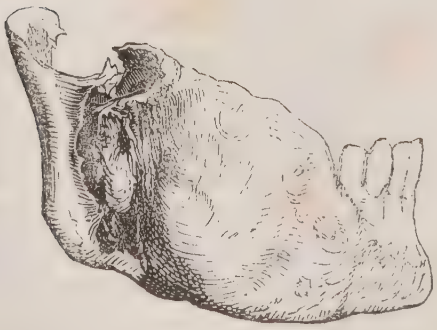
The cuspids of the lower jaw are to be removed by the same means as the incisors. For the extraction of the bicuspids the key is the best instrument. The claw, placed in the usual position, should be rather small, and the fulcrum well covered with lint.

The removal of the first and second molars of the upper jaw will generally be best effected with a pair of large forceps, slightly bent at the blades. In applying this instrument to the teeth in question, the edges must be thrust as far under the border of the gum as possible, and a firm, steady hold taken of the tooth. It is then to be dislodged by first a steady, gradual bearing outwards until it is slightly moved, when, with a contrary motion into its former position, followed by a firm pull downwards, the tooth is removed with considerable facility. The corresponding teeth of the lower jaw may be extracted by the same means, or with a pair of hawk's-bill forceps, the longer blade of which is to be placed on the inner gum. The operator standing on that side of the patient from which the organ is to be removed, and having taken a firm hold, first moves the tooth a little outwards towards himself, and then, with a steady and continuous movement, draws it almost straight from the socket; a motion which the inclination of the handle will greatly facilitate. The wisdom-teeth are best extracted with the forceps; their roots are small, and but little force is required for their removal.

When the crowns of any of the teeth are so entirely destroyed that the forceps and the key are alike insufficient to remove the roots which remain, the elevator, as it is called, will be found a very simple and efficient means to effect it. The edge of the instrument is to be inserted between the root and the alveolus, so far as to secure a sure hold, and the root is then to be lifted, as it were, from the socket, by resting the instrument upon the alveolar process, or even upon the side of a neighbouring tooth. There is not the least danger of injuring the latter if care be taken not to depend too exclusively, nor to bear with too much force upon it. — Ed.]

cavity enlarges, containing pus, perhaps mixed with other fluids, and with disorganised particles of bone. Sometimes the collection proceeds slowly, and the expansion of the bone is gradual and uniform; in other instances, the swelling rapidly attains a large size. As the disease advances, the bony parietes become remarkably thin and delicate, particularly at the more prominent parts of the tumour; and at many points bone is deficient, and its place supplied by membranous expansion. Occasionally alteration of structure takes place in the cyst; solid matter is added, either bony or fibro-cartilaginous, and morbid action proceeds in the new deposit. In acute cases, in which the secretion and distension are rapid, severe pain is felt in the part at the first, and usually continues but little unabated; when the swelling is slow and gradual, considerable pain is experienced during the inflammatory stage, but soon diminishes, or ceases entirely. In every instance, the features are deformed, and the functions of the mouth more or less impeded.

Osteosarcoma may supervene on spina ventosa — morbid action occurring in the parietes, and morbid deposit ensuing, as in the following instance:— The patient was a male, aged twenty-one. Swelling had existed for a considerable time at the posterior part of the lower jaw on the left side. The wisdom tooth and last large grinder, their pulps probably having been blighted, never appeared, and the swelling occupied their situation. The bone was expanded on each side; the upper surface of the tumour was soft, its growth had been gradual, and no great pain or uneasiness was experienced. I cut out an oval portion of the cyst where it projected into the mouth, and well-digested matter was evacuated; a seton was then passed out near the angle of the jaw, and worn for some weeks. The plates of the bone approximated, the cavity contracted, and the discharge ceased. Two years afterwards rapid swelling took place in the same situation, suppuration occurred, and the matter was again discharged by incision; the tumour then subsided. Again inflammatory swelling occurred twelve months afterwards; the same course was followed and the patient relieved. A hard swelling now occupies the jaw from its angle to the canine tooth, it is increasing in size; the necessity for its removal is apparent, and has been decided upon. Very shortly after writing the above, the patient submitted to the disarticulation and removal of fully half of the jaw, represented here. He made a rapid recovery, and showed himself to me and the pupils at the hospital a short time since, and fully five years from the time of the operation, in remarkably good health, and very little deformed by his loss. His whisker effectually conceals the mark of the incisions.



But in general, after free evacuation of the purulent matter from a bony cavity, even of very large size, the space between the parietes diminishes rapidly, the distended and attenuated bone contracts and is condensed, the new deposition is absorbed, and the parts regain their natural and healthy appearance.

In the slighter cases of spina ventosa, removal of the offending teeth or portions of teeth, is generally sufficient; the matter escapes freely enough from the sockets, and the discharge soon ceases. When the cavity is considerable and its parietes thin, a counter-opening at the base of the jaw is required; and it is often of advantage to introduce a small cord from the opening in the mouth through the counter-opening, and to continue its use for a short time, drawing it backwards and forwards in the cavity occasionally. For making the counter-opening and placing the seton at the same time, a strong needle in a fixed handle is most convenient. This practice I have employed in a good many instances, and can confidently recommend as successful. In a large spina ventosa, not complicated with solid growth, the parietes may be removed freely and with safety; the cavity is dressed to the bottom, and gradually fills up by granulation. The division of the integuments to expose the tumour must vary according to the circumstances of the case; the incision of the bone will generally be accomplished by a strong bistoury. Such procedure will seldom fail in procuring a cure, and is less severe, less dangerous, and productive of less deformity, than division of the jaw and entire removal of the diseased portions, an operation which can very seldom be warranted for spina ventosa. In the following case, the tumour was the largest of this kind which I have met with in the jaw, and yielded to the treatment just noticed. The patient was a male, æt. 48; he applied to me in 1821. The tumour had been of three or four years' duration, equalled a large fist in size, and involved the left side of the lower jaw at the junction of the ramus with the body of the bone. The sac extended behind the coronoid process, and downwards, through the substance of the jaw, amongst the hyoid muscles. Several carious teeth and stumps were imbedded in the swelling; the projection was chiefly lateral, the parietes were yielding, and the line of the jaw could be traced from below. There was occasional slight discharge of purulent matter from the neighbourhood of the involved teeth. The cheek was laid open, and the bony and cartilaginous parietes of the cavity completely removed; the bleeding from the bony surface was arrested by cautery and pressure.

The soft parts united kindly, and the patient obtained a rapid, perfect, and permanent cure, returning home with the cheek united in ten days after the operation.

Solid Tumour of the Lower Jaw — *Osteosarcoma* — commences in the internal structure of the bone, frequently in the neighbourhood of stumps. The origin may be traced to external injury of the part; or the disease may take place in the jaw, either along with osteosarcomatous tumours of other bones, or subsequently to their development; in such circumstances a peculiar disposition of the system is the only cause that can be assigned. The tumour generally occupies the lateral parts of the bone. Its growth may be either slow or rapid, and is attended with dull uneasiness, rather than acute pain.

At first the morbid deposit is confined to the cancellated texture, but as it increases the external laminæ are distended, and at last give way at one or more points, and the tumour protrudes fungous into the mouth. The consistence of the mass is various, it may be soft and brain-like, or cartilaginous, mixed with bone and fibrous matter in various proportions; but the anatomical characters of these tumours have been already detailed, and need not be here repeated. The features are much deformed, the swelling seriously incommodes the neighbouring parts; the teeth loosen and drop away, and fungi arise from the sockets; a fetid, thin, sometimes bloody discharge is secreted copiously, and the health declines. The part protruding around the gums is deeply indented by the teeth of the upper jaw; it separates the jaws to a greater or less extent, prevents closure of the lips, induces salivation, and impedes the taking of nourishment. The tumour is one of those which are apt to be reproduced, and if unmolested, gradually undermines the system, and ultimately the patient perishes very miserably. At one time every instance of it was regarded as hopeless; but of late a great many tumours, in various stages of advancement, have been removed successfully by British and foreign surgeons. In some instances, the portion of the jaw containing the morbid growth has been sawn out; in others, one half of the bone, or more, has been removed by disarticulation, after being divided beyond the diseased part. A very few weeks ago, I had occasion to remove fully three-fourths of this bone, from the site of the first large molar on the left side to the condyle of the right. The patient, an elderly female, is convalescent. The operation is severe, and to a spectator shocking enough; but it can be undertaken with safety, and in most cases with almost a certainty of favourable termination. In no other way, assuredly, can the disease be eradicated. Partial excisions, applications of the cautery, &c., only hasten the malignant process.

To expose the tumour and admit of the bone being readily divided, incision of the soft parts requires to be extensive. And previously to determining on the plan of operation, the extent of the disease must be ascertained accurately. If, for example, the tumour is included between the lateral incisor tooth and last molar on the same side — these teeth must be extracted to permit division at these points. A semilunar incision may then be made along the base of the jaw, the horns of the incision pointing upwards and passing over the space which was occupied by the extracted teeth. The flap is dissected up, and the membrane of the cheek divided along the line of incision. The bistoury is then carried along the inside of the bone so as to divide the membrane of the mouth and separate the attachments of the muscles. The tongue is pushed aside, and a copper spitula placed under the jaw at the part to be divided, in order that the soft parts may not be injured during the sawing. A small narrow saw, or one commonly known by the name of Hey's, is applied to the bone at the points where the teeth were extracted, and by a few motions of this instrument a notch is made of no great depth; a pair of strong cutting pliers are placed in the track, and by them division of the bone is accomplished with equal neatness, and much more rapidly than if the use of the saw had been continued. The pliers should be strong in every point, and the handles long, to afford the advantage of a powerful lever. In edentulous subjects, as the one alluded to above, there is no necessity for using the saw at all: the bone is at once and easily cut by the forceps. The chain saw has been recommended for performing the section of the bone, but I have not yet seen one to be depended on; it is not only slow, but uncertain, in its operation.

The incisions may be made otherwise. The cheek may be divided by passing through it a long narrow bistoury, close to the anterior edge of the masseter muscle, and carrying the instrument forwards and through at the angle of the mouth. From each extremity of this incision another is made downwards, the anterior one inclining forwards, the other backwards. By reflection of the flap thus formed, the bone is exposed more easily, rapidly, and perfectly, than by the former mode of incision. The objection to this mode of procedure is the deformity occasioned by the scars, though, if care is taken in putting the edges together, this is very slight indeed, and not remarkable.

In either method, no artery, except the facial, requires to be secured by ligature. After division of the bone, the attachments of the tumour, which may not have been separated previously, are cut with the bistoury, the cavity is filled lightly with charpie, and the incisions are carefully and neatly put together, and retained by points of interrupted and twisted suture; the latter form of suture being adopted at those points where accurate coaptation is most important.

The *symphysis* of the lower jaw has been removed, and its extirpation may again be rendered necessary, either on account of tumour commencing in its internal structure, or from disease of the sockets extending deeply and approaching the base. I removed it in a case of malignant disease, by which, and by the applications used as remedies, great ravages had been made on the under lip; the gums and alveoli were involved, as also the bone, to a considerable extent, without any apparent affection of the lymphatics. Nothing untoward occurred in the operation, and the case was proceeding favourably; but after some weeks the patient was seized with violent erysipelas of the face and head, and perished. One objection to the operation is, that the muscular attachments of the tongue to the symphysis cannot be divided without some risk; the antagonist muscles are unrestrained; the os hyoides and root of the tongue may be drawn backwards upon the forepart of the vertebræ, so as to close the air-passage, and cause suffocation. This is guarded against by the introduction of a thick ligature. The disposition to retraction soon ceases.

Disarticulation of one side of the jaw is not unfrequently necessary; it is absolutely required when the tumour encroaches upon and involves the angle and ramus. It is a more severe operation than excision of part of the bone, and attended with greater risk; yet it may be advised and undertaken with a very fair and probable chance of ultimate success. The incision of the cheek is made to incline more upwards than those recommended for partial excision, and is extended to over the articulation of the jaw; from this point, another is made in the direction of the ramus, and prolonged an inch or more beyond the angle. A third incision is made perpendicular to the first, or to the lower lip, over that part of the bone in front which is to be divided. The flap is turned down, and the muscles and membrane of the mouth separated from the bone opposite to the last incision; after which, the finger is passed through to complete the detachment. A preferable form of incision along the posterior border of the ramus and under the base of the jaw and tumour to over the point at which the bone is to be sawn, but without division of the lip, is recommended in the *Practical Surgery.* This method I have practised repeatedly; the cicatrix is then completely out of sight, and in the male is entirely covered and concealed. During the cure, also, the discharges escape more readily, the opening being quite dependent. The bone is then divided at that point by the saw and pliers, the tooth in the line of the track having been extracted previously to the commencement of the operation. The cut end of the jaw is laid hold of by the left hand, and depressed, and the bistoury carried backwards along the internal surface, to effect detachment as far as the angle. The bone is still more depressed, and the temporal muscle cut from the coronoid process. The mass is thus loosened, and forced downwards and backwards on the neck; the forepart of the capsule is then cut, and the bone twisted out. Separation of the remaining attachments is completed by a few rapid strokes of the knife, and the whole mass removed. Hemorrhage is then to be permanently arrested, but instead of immediately tying every open mouth which presents itself, it is sometimes better to expose the common trunk of the internal maxillary and temporal arteries — which is easily effected, as it emerges from under the digastric muscle — and to pass a ligature beneath it, by means of an aneurism needle. This is more quickly done than the applying of ligatures to the many branches of this trunk which have been divided. The other vessels — the facial, branches of the lingual, &c. — are then tied, the cavity is filled with charpie, and the incisions of the soft parts are carefully closed. In these, union by the first intention usually takes place nearly throughout the whole extent; suppuration occurs from the deep wound; the charpie is dislodged gradatim, and removed; granulations spring up; and, after some time, the cavity is obliterated. The cheek must necessarily fall inward very considerably, but the deformity is not to be compared to that caused by the tumour. During granulation, the patient is made comfortable by the frequent use of tepid gargles, lodgement of pus in the mouth being thereby diminished. Articulation and mastication are not so perfect as when the jaw was entire and sound; but the patient gradually becomes accustomed to the want, and these functions improve. A contrivance described in the *Practical Surgery* is used to prevent the remaining portion of jaw from being drawn towards the mesial line, and to keep the teeth opposite to those of the corresponding side of the upper jaw. Partial paralysis of the side of the face necessarily follows, for there is no possibility of accomplishing disarticulation of the jaw without dividing many branches of the portio dura.

Supposing that the portion of the jaw between the angle and symphysis had been removed on account of osteosarcoma, and that the ramus subsequently became affected, it is no easy matter to effect disarticulation, as I have experienced. — The patient was a female, aged 30, of delicate constitution, and subject to toothache from infancy. I removed an osteosarcomatous tumour, extending from the angle to the canine tooth, on the right side. Division was made wide of the existing disease, and the sawn surfaces appeared quite healthy; but about five months afterwards, symptoms of return occurred in the ramus, and ten months after the first operation disarticulation was indispensable. The operation was accomplished with very considerable difficulty, on account of there being no lever to overcome the action of the temporal muscle. After separating the attachments as much as possible, an attempt was made to force down the coronoid process, from under the zygoma, by pushing the lower end of the bone backwards, in order to divide the insertion of the temporal muscle; but this proved ineffectual. The capsular ligament of the joint was then divided, and the bone with difficulty turned over from behind, forwards. It was then detached underneath the coronoid process, pulled down from under the zygoma, and the temporal muscle at length divided at its insertion.

In none of these operations is there a necessity for preliminary exposure and ligature of either the carotid artery or its branches; by so doing, a great addition is made to the patient's sufferings, the real operation is only commenced when the patient supposes it should have been finished, and he is thus annoyed and worn out. The flow of blood is easily moderated, or altogether arrested, by the pressure of an assistant's fingers against the forepart of the vertebræ, below the angle of the jaw.

The position of the patient is either recumbent, with the face turned from the operator, or sitting with the head supported and steadied.

The instruments required are, a very strong, sharp-pointed bistoury, for division of the soft parts; saws, of which Hey's is to be preferred for notching the bone; strong and long pliers, for completing its section; an aneurism needle, for securing the common trunk of the temporal and internal maxillary artery; dissecting and artery forceps, hooks blunt and sharp, narrow copper spatulæ, ligatures, &c.

Wounds of the Face and Neck. — Accidental wounds of the face may involve the more important bloodvessels and nerves, and interfere with the eye or its appendages, with the nose, or with the mouth. Injury of these parts is to be avoided in incisions premeditated for the removal of disease or deformity; and, in such premeditated wounds, the line of incision should always be, if possible, in the direction of the muscular fibres. The bleeding seldom proves troublesome; pressure on the vessels, as they pass over the bones, arrests it temporarily; and ligature is seldom required, accurate adaptation of the divided surfaces proving sufficient for effecting permanent closure of the divided branches. Paralysis, more or less extensive, follows division of the nerves and muscles. But paralysis of the face also arises from a variety of other causes; it often remains after injuries of the head, probably in consequence of extravasation on the brain; it attends on morbid formations in the substance of the brain, or in its membranes, and follows long-continued irritation in the neighbourhood of the nerves. Paralysis from the last-mentioned causes is not likely to be recovered from; that following simple division of nerve, may disappear after a considerable time, the nervous tissue reuniting, and resuming its functions. When there is reason to suppose that the nervous function is alone deranged, while the structure remains sound and the continuity undissolved, advantage may follow the application of strychnine to a raw surface over the course of the affected nerves.

In Tic Doloureux, division of the nerves of the face, as they pass out of the foramina, is seldom resorted to; nor ought it to be practised, unless at the urgent request of the patient, and after all other means have failed to afford relief; and even then the operation is scarcely warrantable, since it may be said never to have succeeded in affording permanent relief. We must trust to milder measures, to the removal of local irritations, to paying strict attention to the digestive organs, to the administration of purgatives, tonics, and anodynes; occasionally benefit has resulted from the external use of the nitrate of silver, applied so as to cause very slight vesication. Ointments containing veratria and aconitine have been used with advantage, and the endermic application of the salts of morphia has also been found useful.

Spasmodic action of the muscles of the face, without pain, sometimes follows wounds and other injuries of the nerves which supply them; and sometimes no cause can be assigned for the occurrence. In this affection also, the application of nitrate of silver to the integuments over the nerves may sometimes be made with advantage.

Division of the parotid duct, or wound of the gland itself, is occasionally followed by the formation of a fistulous aperture, discharging saliva over the cheek. We endeavour to prevent this by accurate union of the recent wound. After the fistula has formed, an opening is to be made from it into the mouth, and kept pervious; the external aperture is then closed by suture after excision of the smooth edges, or is made to contract by the repeated application of a heated wire; pressure alone is of little use.

All wounds of the face are to be put into the most favourable state for healing without granulation, so that deformity may be prevented as much as possible. The twisted suture is best adapted for this purpose; more accurate coaptation being thereby obtained than by the interrupted form. In extensive wounds, the parts may be brought somewhat into their proper position by a few points of interrupted suture; twisted sutures are then placed in the intervals, and the isinglass plaster is of use in closing those points which may still gape slightly; in many cases, the greater part of the approximation may be accomplished by isinglass plaster alone.*

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* [I have been in the habit, for many years, of keeping the edges of incised wounds of the face, forehead, and eyelids, in contact with gold pins finer than the most delicate sewing-needle. They should

Deep wounds behind the angle of the jaw, and at the lateral and lower parts of the neck, are highly dangerous; indeed they are almost certainly and immediately fatal, as can readily be understood when the large bloodvessels and important nerves are considered which have their course in these parts, and which must be either wounded or completely divided. The bleeding has in some cases been arrested by immediate ligature of the divided extremities of the vessel, by firm and permanent pressure, or by pressure at first, and ligature of the trunk of the vessel on the recurrence of hemorrhage after the lapse of many days; of these methods immediate ligature of each extremity is certainly the safest and best. In lacerated wounds violent hemorrhage may take place some time after the infliction of the injury, from ulceration or sloughing of a large artery; in such circumstances either permanent pressure may be resorted to, or ligature applied to the vessel above and below the open point.

Dissections for the removal of morbid growths in the situations just mentioned must be conducted with much caution, and with a full recollection of the relative anatomy. Unless the tumour be tolerably loose and defined, it ought not to be interfered with. But it is to be recollected that tumours of these parts are bound down by their condensed coverings — the platysma myoides and cervical fasciæ; and that after division of these, the tumour, if not intimately incorporated with the neighbouring tissues, is loosened, and often enough can be readily detached.

From constant external pressure, tumours growing rapidly spread amongst the deep parts, and often form firm attachments. The parotid is displaced, and almost entirely absorbed, by the pressure of tumours growing out of the lymphatic glands which are lodged on its anterior surface. Such tumours attain a large size, and occupy the exact situation of the parotid; on their removal, the space betwixt the angle of the jaw and the mastoid process is completely exposed, and the styloid and pterygoid processes can be distinctly felt. From these circumstances many have been led to believe that they have dissected out the parotid; but this and the other salivary glands seldom if ever degenerate. And if the parotid do become the seat of carcinoma or medullary sarcoma, it is impossible to remove it with either safety or advantage. Even in the healthy state, removal of the parotid is a troublesome dissection; and the difficulty must be greatly increased when enlargement has taken place from disease, when neighbouring parts are involved, when firm and deep connections have been formed, and important structures encroached upon. I have taken away many tumours from the site of the parotid, and

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be from an inch to an inch and a half in length, and be provided with heads of sealing-wax, by which they can be more easily carried across the skin than in any other way. From the materials of which they are composed they are entirely exempt from oxidation, which is not the case with the common needle; and I am convinced, from ample experience, that wounds thus healed are seldom attended with permanent deformity, from the formation of unsightly scars. — Ed.]

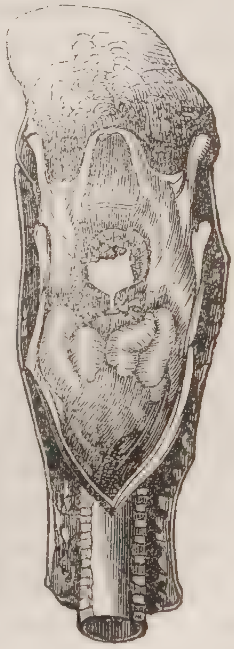
some of large size, but would scarcely attempt, or boast, as some have done, of having removed, the diseased gland itself.

The incisions, for the removal of the tumours of which we have been speaking, are to be made in the direction of the fibres of those muscles which are interposed betwixt them and the integuments, in the direction of the bloodvessels and nerves, and towards those points where the vessels are expected to enter the diseased mass. Attention to the last recommendation is important in order to save blood. For when the trunks of the arteries are divided at the commencement of the dissection, they are easily secured temporarily by the fingers of an assistant: the operation is proceeded in and accomplished with scarcely any further hemorrhage, and in many instances no other vessels require ligature; whereas, if an opposite course be pursued, the same vessels will be divided three or four different times; the hemorrhage will be greater, and the operation delayed. By cutting also in the direction of the vessels and nerves, fewer arteries are divided, and nerves are less apt to be injured, than if the incisions were made across.

Wounds inflicted with the view of effecting suicide are generally on the fore and upper part of the neck, and their severity depends on the resolution of the individual. Some penetrate the integuments merely, and are consequently of slight extent; there is little bleeding, and the edges are easily brought together, after the cessation of bleeding and when the surfaces are glazed, by inclining the head forwards, and introducing a few points of suture. Others divide the muscles, and branches of the lingual or of the superior thyroid arteries; such wounds are gaping, more extensive than the former, and accompanied with smart hemorrhage. Some penetrate the mouth, separating the os hyoides, tongue, and epiglottis from the thyroid cartilage. Occasionally the wound is lower, through the thyroid, or betwixt that cartilage and the cricoid; and sometimes through these into the gullet; it is seldom lower. Such are truly horrible; the countenance is contorted, and presents a frightful expression; inspiration is difficult, hurried, and noisy, and at each expiration blood frothed with air is forcibly ejected from the wound. I have seen wounds of the trachea, near the top of the sternum, but without extensive division of the lateral parts; large wounds, such as are usually made at the upper part of the neck, could not be inflicted here without division of the large vessels, and instant death. Some determined suicides reach the vessels even high in the neck, dividing everything down to the vertebræ; immediate dissolution takes place from loss of blood. But, in general, mere opening of the air-passage is all that is aimed at, there being a vulgar notion that this is sufficient for the extinction of life. A considerable quantity of blood is lost, though the branches only of the external carotid are wounded, and the loss may prove fatal; but the hemorrhage generally ceases on syncope taking place; and if the patient be then discovered, means should be immediately adopted for permanently arresting it. Its recurrence may cause death, on the patient recovering from the first faint; or he may die some days after, from the effects of loss of blood. Hemorrhage, though to no very alarming extent, is always to be dreaded in those advanced in life; though in most cases the fatal result is not attributable solely to the bleeding, but is expedited by other circumstances, as defective supply of proper nourishment, and an unfavourable state of the mind.

Some patients seem to be going on most favourably towards a cure, but, within two days after the injury, are suddenly seized with difficult breathing, and die in a few minutes. On the examination of such, blood is sometimes found in the ramifications of the bronchial tubes, and the lungs can contain little or no air; or the bronchial tubes and ramifications are loaded with adherent mucus; in either case the patients die from asphyxia. In others, nothing remarkable is observed; perhaps passage of the air may have been prevented by inspissated mucus lodging in the windpipe around the wound, and closing the aperture, or by faulty adaptation of the divided surfaces. Likewise, during motion of the head, or attempts to swallow, either the upper or lower part of the windpipe may change its relative position; the continuity of the tube will be thereby destroyed, either partially or wholly, and suffocation ensue. When the wound is large and transverse, as the majority of such wounds are, there is difficulty in freeing the air-passage from mucus. This result becomes evident, when we consider how coughing is effected in the healthy state of parts — that the upper part of the windpipe is contracted by its own muscles, and the air driven through, by sudden action of the muscles of the chest, in a forcible and small stream, so as to carry the mucus along with it. This process cannot be accomplished when the muscles employed in contracting the orifice of the larynx are injured, or when an opening is formed below the glottis, through which the patient breathes, either wholly or in part.

In other cases, death is more slow. The patient is seized with dyspnœa, great anxiety, and occasional spasmodic action of the muscles of respiration, which symptoms gradually become more urgent and alarming. They are attributable to awkward position of the parts, to swelling around the wound, inflammatory or œdematous and rapid or slow, or to bronchitis. To the latter affection patients breathing through artificial openings in the larynx or trachea are peculiarly subject, probably from the inspired air not being heated, as in natural respiration, before it enters the bronchial tubes. A view from behind is here introduced of the larynx of a patient who some weeks previously attempted suicide by wounding the forepart of the neck. By some mismanagement the edges of the incision were kept asunder, and they cicatrised. The patient was seized with difficult breathing, the inspirations were rare, long, and laborious; he had threatening of suffocation during his disturbed sleep. These symptoms were disregarded. He started up suddenly in the night, caught hold of the patient in the next bed, and fell down in a state of asphyxia, from which he could not be recovered. The œdematous swelling of the rima glottidis is remarkable; beyond that is seen the rounded opening betwixt the thyroid cartilage and epiglottis, which is in a normal state.



The bleeding is to be arrested as speedily as possible by ligature, and the patient placed in bed with the head and shoulders raised. The edges of the wound are brought together by attention to the position of the head; but, provided the patient breathes easily with the wound open, closure should not be attempted till after eight, ten, or twelve hours — that is, not until all oozing of blood has ceased; the time depends on the extent to which the air-tube has been divided. There is little chance of immediate union taking place; and the wound not being approximated when recent and bleeding, does not diminish the chance, but on the contrary augments it. Adhesion is prevented by the insinuation of air and mucus betwixt the edges, by frequent motion of the edges on each other, by the slightest change in the position of the head, either rotatory or nodding, by the action of the muscles of the os hyoides, and by attempting to swallow food or saliva. Every circumstance is opposed to complete approximation and immediate union of transverse wounds of the throat.

Plasters and bandages surrounding the part are inapplicable, and unwarrantable from the interruption thereby caused to breathing and circulation; they likewise prevent the escape of mucus and air. Emphysema is apt to occur in consequence, and may prove troublesome; the cellular tissue of the neck becomes filled, so as to interfere with free respiration, and the infiltration of air extends over the face and chest. Neither can many stitches be used without bad effects. The corners of an extensive wound may be kept together by points of suture; and one may be placed at the middle, through the integuments only, to prevent overlapping or inversion of the edges. The head is placed in a comfortable position, inclined forwards, and secured by a bandage passed round it, with the ends brought down and fixed to a band round the chest. In many cases the patient requires to be watched attentively, to have the motions of his hands restrained by proper means, in order to prevent him from interfering with the wound, or committing other insane acts which might prove dangerous. The state of the breathing and of the pulse must be strictly attended to; inflammatory symptoms must be actively combated, and swelling prevented from gaining a dangerous extent, by bleeding, general and local. But depletion is indeed very seldom necessary, the loss of blood in the first instance proving a pretty effectual preventive of inflammation; it is more frequently requisite to administer nourishment or even stimulants; but these must be given gradually in those advanced in life, and in those who have lost much blood.

The slightest difficulty or noisiness of breathing must be closely watched, and on the occurrence of any alarming symptoms, energetic measures adopted. Swelling about the wound, producing difficult expectoration and a diminished current of air, may require the making of a longitudinal opening into the trachea below the wound, and the insertion of a tube. Thus the respiration is quickly relieved; and the patient is soon able to regulate the size of the aperture; he is readily taught to apply his finger over part of the orifice of the tube, when it is wished to clear the passage from mucus. The operation of tracheotomy should be had recourse to in such cases without hesitation or delay; there is no danger from its performance, but much from its being withheld.

If the mouth or gullet have not been opened by the cutting instrument, or only slightly, the patient may be allowed to swallow naturally; though it is true that even the slightest motion of the parts affects the wound injuriously. But, as already observed, immediate union is not to be expected; swallowing, or attempting to swallow, saliva, produces an involuntary action of the muscles, quite as prejudicial as the swallowing of liquids in large quantity does; and these motions cannot be prevented, since the patient has no control over them. If the wound of the mouth or gullet is extensive, portions of the ingesta are apt to interfere with the air-tube, particularly if the wound is high, and the epiglottis cut away or difigured. In such cases, soups and other nutritious fluids are conveyed through an elastic tube, passed by the mouth over the root of the tongue to beyond the injured part, and introduced only when it becomes necessary to administer food; or a small tube may be passed by the nostril, and retained. If the wound is very severe, and the necessity for thus conveying nourishment likely to continue long, the latter method is adopted; it is more difficult in execution than the former, but when the instrument is once passed, no further trouble is given to either the patient or surgeon. Small quantities of nourishment are to be given frequently, of such strength as the symptoms indicate; many patients have died from inattention on this score.

Many have died suddenly and unexpectedly (though this should not be, if symptoms and circumstances were attended to) from the effects of apparently slight wounds; whilst others have recovered, when recovery was unlooked for, after dreadful injuries, and these perhaps not treated in the most approved manner. In illustration, I shall briefly detail, though it did not fall under my own observation, an interesting and remarkable case of recovery. A criminal under confinement attempted suicide by transverse wound of the throat. The larynx was severed at the upper part of the cricoid cartilage, and the cut extremities had retracted at least three inches; the œsophagus was also cut across, but the extent to which it had receded was not ascertained. A large quantity of blood had been lost; attempts were made to bring the parts together, but were abandoned on account of the violent dyspnœa which was induced. The attendant endeavoured in vain to pass an elastic gum tube into the gullet, from the nose and from the mouth. The patient was kept alive by nutritious enema. On the second day after the accident, the cut extremities of the larynx were approximated by two ligatures; and, the retraction being thereby diminished, it was then discovered that there was another wound between the cricoid cartilage and the trachea. All ingesta by the mouth passed through the upper wound. On the fifth day, the ligatures separated, and the larynx again retracted. On the sixth, an elastic gum catheter was passed into the inferior cut extremity of the gullet, and through this nutritious fluids were regularly administered. The wound granulated, and filled up in some measure; the patient continued to receive both air and nourishment through tubes introduced downwards from the wound in the throat. Whilst pouring in food, saliva was secreted in the mouth in great profusion. The sense of smelling remained tolerably acute, and he also possessed the power of imperfect whispering articulation.

When, from the untoward circumstances of the case, or from neglect, the opening in the windpipe remains long open, and becomes fistulous, the larynx contracts, and the voice is in a great measure lost, the patient breathes almost entirely by the unnatural opening, and all the respiratory functions are conducted imperfectly. But even this state of parts may admit of remedy, as is exemplified by the following case: Elizabeth Oswald, aged twenty-seven, attempted suicide in 1826, and wounded the larynx through the crico-thyroid ligament. She was under treatment for several months; but was at length abandoned with loss of voice, breathing entirely through a silver tube placed in the original wound. On her applying to me, I found the larynx had contracted; an exceedingly minute aperture, not capable of admitting a common dressing probe, extended from the wound towards the glottis, constituting all that remained of the upper part of the natural air-passage at this point. Small bougies were introduced from the wound into this diminutive canal; and by gradually increasing their size, the passage was brought to its natural diameter in less than three months. Part of the trachea below the wound had also contracted considerably, and was dilated by similar means.

A long œsophagus tube was introduced by the wound into the mouth, there laid hold of and drawn upwards, and then pushed down into the trachea, so that it extended from the mouth to some inches below the wound of the trachea. Its introduction was followed by a severe fit of coughing, which lasted about half an hour. The tube, nine inches long, and equal in diameter to the largest œsophagus tube, was retained in the windpipe for fifteen days, during which it caused great salivation; the teeth loosened, and the strength was extremely reduced.

The callous edges of the wound were removed by incision, and the opening closed by suture. The tube was removed on the tenth day thereafter, and the patient breathed well. Within a few hours, however, respiration became difficult, and tracheotomy (below the isthmus of the thyroid) was performed. A silver tube was introduced into this recent longitudinal opening, and retained for five days, when it was replaced by a smaller one. After twenty days, this tube was also removed, and in a short time afterwards the wound closed completely. The patient continued to breathe with ease through the larynx, and slowly recovered her voice. When agitated, or after sudden and violent exertion, her inspirations are a little longer than natural, but in other respects the cure is complete. She was in very good health some years after the restoration of the air-tube.

Laryngitis, cynanche trachealis, most frequently occurs in children, and in them it is termed *croup;* but it also, though rarely, attacks adults. The voice is brazen, hoarse, and croaking; the cough is barking, and the countenance suffused. Inspiration is long, painful, effected with much difficulty, and attended with a wheezing or rattling noise. Expiration, on the contrary, is easy.

Difficult inspiration is a symptom common to all affections of the larynx, and admits of ready explanation. The membrane lining the glottis is thickened, and covered also by a viscid mucus; the passage is thus much contracted; the muscles, by the action of which the rima is opened, participate in the inflammatory action, and are thereby incapacitated for the full performance of their functions. While inspiration is thus difficult, expiration is more easy, all the powerful muscles of the chest combining to empty the lungs of the little air which they receive.

In croup, there is confusion and pain of the head, the lips are of a livid hue, and the veins of the neck are much distended. Respiration is extremely laborious, the chest and nostrils heave, and all the auxiliary muscles of respiration are called into play. Sleep is broken and unrefreshing; the patient starts, much alarmed, from a feeling of impending suffocation, and catches at the nearest object. The circulation is accelerated, and becomes weak and irregular as the disease advances.

A common cause of croup is exposure to cold and damp; but the frequency of its occurrence in children is attributable to dentition. Dentition induces a long catalogue of infantile diseases, and is intimately connected with most cases of croup. Children are besides of a peculiarly irritable system; and in them disorder of the digestive organs may, in many instances, be considered as at least a predisposing cause, and in all cases it is a constant attendant on the disease. It may also be occasioned by inflammatory action extending to the larynx and trachea from a neighbouring surface; from the fauces, for instance. In some instances inflammatory swelling has been produced by the direct application of stimuli to the membrane; as by the patient inadvertently swallowing boiling water, and a portion of the hot fluid, or rather of the steam, being drawn into the windpipe. It is supposed that certain slight degrees of this affection are to be ascribed to spasm; in nervous and hysterical females, paroxysms of slight difficulty in breathing are not of unfrequent occurrence, and in them it may be ascribed, with much probability, to a spasmodic action. The expiration may be then performed with difficulty, and occasionally there is almost complete aphonia. In children, dyspnœa, apparently dependent on spasm, is produced by some affection of the base of the brain.

The most desirable termination of the disease is of course resolution — the cough, pain, and uneasiness subsiding, and the constitution gradually attaining its former state of composure. Too frequently, however, the inflammatory action proceeds unabated, and terminates in effusion of lymph, which is generally of great extent, adhering to the surface of the mucous lining, and forming what is termed a false or adventitious tubular membrane. On the occurrence of lymphatic formation, dyspnœa is much aggravated; and the second stage of the disease is then said to have commenced. Occasionally the patient sinks before effusion has taken place. The extent to which the pseudo-membranous deposit occurs is extremely various; in some cases it is confined to the larynx, or to the upper part of it; in others it lines the whole of the windpipe, and often is prolonged, either in flakes or tubes, into the ramifications of the bronchi. In general, it is not at every point adherent to the mucous membrane, but more or less detached, particularly at its inferior extremity, by a quantity of vitiated mucus which intervenes between it and the mucous surface, and is intimately adherent to the latter. The mucous membrane is also slightly elevated by effusion into the subjacent cellular tissue.

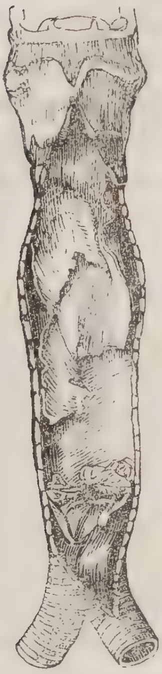
By the formation of false membrane, the symptoms may be so much increased as to cause speedy dissolution; but in many cases the patient's strength is not altogether exhausted, and the extraneous substance by its irritation causes frequent and violent attempts to expectorate, by which the lymph is not unfrequently expelled either entire or in irregular portions; the relief thereby afforded, though considerable, is in general temporary, for lymph is speedily redeposited, or there is a profuse muco-purulent expectoration, and the patient succumbs. It has been already stated that a portion of the false membrane is usually detached from the lining membrane of the canal, and from this the existence of the membrane is in general easily recognised; for on its being moved by the passage of air in the canal, a peculiar sound is frequently audible, and has been compared to that made by the movement of the valve or clapper of a pump. When perceived during inspiration, it indicates that the membrane is detached at its superior extremity; when in expiration, that the separation has occurred inferiorly. A fatal termination may suddenly take place, in consequence of the detached extremity being so displaced by the passage of the air as to form a complete valve, obstructing respiration, and causing death by suffocation.

When the inflammation extends into the bronchi and substance of the lungs, laborious breathing and the mucous rattle occur. The bronchi are obstructed by vitiated mucus, or by lymph, and serum is effused at the base of the brain; and from either or both of these circumstances the patient soon perishes. In children the gums should be looked to, and if swollen or tender, they must be freely scarified; this always affords relief, and often forms the most important part of the treatment. The bowels must be completely freed from the fetid dark-coloured matter which they contain; and if this be effected at an early period, it will generally be sufficient to arrest the progress of the disease. Calomel is the medicine usually preferred, not only from its excellent qualities as correcting and purging out the vitiated secretions, but also on account of its supposed effect of preventing lymphatic effusion. To the procuring of copious evacuations from the stomach and bowels, the attention of the practitioner ought to be chiefly directed at the commencement. With the same view, emetics are of much service. The warm bath will be of use in promoting the cutaneous discharge, and assisting to allay irritation. When the inflammatory symptoms are violent, bleeding, both local and general, is indispensable, and must be had recourse to early; for during the commencement only of the disease can it be of service. The first, or acute, inflammatory stage is of but short continuance, speedily terminating in effusion; and when this has occurred, the symptoms all denote debility of the system, and will be irreparably aggravated by depletion. The most effectual mode of abstracting blood, is by opening the external jugular vein, and this may be followed by the application of leeches to the forepart of the neck; in the second stage of the disease, their place is to be supplied by blisters, and other counter-irritants. Much benefit will be derived from the continued use of nauseating doses of the tartrite of antimony; in the first stage the vascular action will be thereby subdued, and in the second the medicine acts as a powerful expectorant, determines to the surface, and promotes the evacuations from the bowels. Often, however, the disease defies all sanative measures, and advances unsubdued to a fatal termination.

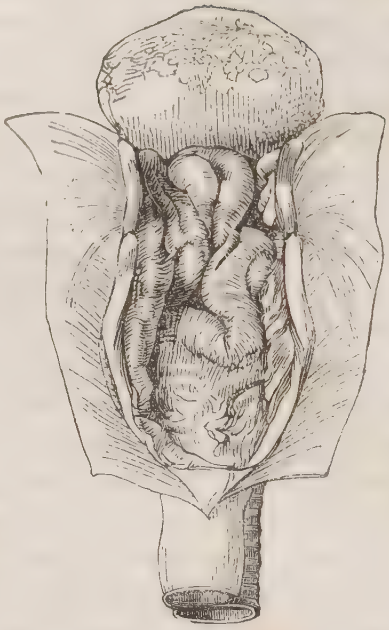
Tracheotomy has been both proposed and performed in this disease. Recourse to it is not warrantable till the later period of the affection, and then it will be found unavailing. If performed early, there is found no obstruction to respiration that can be removed; it can therefore be of no service, and is not required. If it be undertaken at a more advanced period, lymph will most probably be found to extend below the incision; the bronchial tubes and the substance of the lungs are then the principal seat of the disease, and consequently the operation is futile, at least in children. When first I entered on practice I was several times prevailed on to perform tracheotomy on children labouring under croup; the results were unsuccessful, and from my own experience I cannot recommend the practice.

The fauces and larynx of children are occasionally injured, as stated above, by the attempt to swallow by mistake boiling water, and inhaling the steam. The alarming symptoms follow in a very few hours, in consequence of the formation of numerous minute vesicles, with swelling, from effusion of serum into the submucous tissue. Great pain is generally experienced at the moment, but after crying violently the child may fall asleep and awaken croupy, and with threatened suffocation. By this time inflammatory action has been fairly established, the submucous effusion has begun to take place, and it is this that gives rise to the danger. The excited action is to be combated by leeching and exhibition of calomel in small doses, with or without opium frequently repeated, so as to arrest the lymphatic effusion, which is apt to supervene. When these means fail, tracheotomy must be resorted to without delay. The fauces and upper part of the larynx are only involved at first; this practice is sound, and good success may be expected from the operation. The breathing has been suddenly suspended in children by the attempt to swallow acrid fluids, such as alkaline solutions, or concentrated acids.

Cynanche laryngea, in adults, is of comparatively rare occurrence; at least that kind of inflammation of the windpipe, which in children is so rapid in its progress, and so prone to terminate in effusion of lymph, is not often met with in persons of an advanced age. Inflammatory affections of the larynx and trachea are, however, by no means unfrequent in adults; but are of a very different character, as to symptoms, progress, and termination, from that affection which is strictly denominated croup. Pain is felt in the region of the windpipe, and is aggravated by pressure on the forepart of the neck, by speaking, and by deglutition; expectoration is increased, and ultimately assumes a muco-purulent character. The voice is altered in tone and in strength, and occasionally there is complete aphonia. Frequently these symptoms, after having continued for a short time, gradually subside; if not, the mucous membrane, particularly in the upper part of the larynx, becomes thickened and considerably softened in texture, with effusion of serous fluid in the subjacent cellular tissue, and apparently in the substance of the membrane itself. In consequence of such effusion, the difficulty of breathing is much increased. Occasionally lymph is effused on the surface of the membrane; but this is seldom met with, and when it does take place, is generally confined to the upper part of the larynx. The larynx and trachea of an old lady of seventy years is here shown, with very extensive false membranes blocking up the bronchi; a large portion besides was coughed up. The specimen, a rare one, is in my collection.



The effusion of serum is often abundant, causing protrusion of the mucous membrane, and narrowing of the canal; and when it is limited to the upper part of the larynx, as frequently happens, the disease is termed *Œdema Glottidis.* In this affection, the majority of the symptoms, which have been already enumerated as attendant on laryngitis, are all present, and in an aggravated form. Inspiration is extremely difficult and sibilant, and occasionally the patient experiences a sensation, as if a foreign body were lodged in the passage, and had changed its position on the muscles of the part being put in motion. The symptoms of œdema come on gradually in some cases, in others with alarming rapidity. They often follow ulcerations of the soft palate, and of the root of the tongue, as shown in treating of diseases of that organ, occurring on the patient being exposed to cold or moisture, or supervening rapidly when discharge from the ulcerations is by any accident suddenly suppressed. The difficult breathing, with cough and violent attempts at expectoration, takes place in paroxysms, and often to so alarming a degree as to threaten immediate suffocation, especially during the night. The patient, if he has fallen asleep, often starts up suddenly, and catches at the nearest object, having dreamed probably of drowning or strangulation. Deglutition is seriously impeded, the strength is exhausted, the body is emaciated, the features become contracted, and evince great anxiety. As already stated, the serous effusion is chiefly situated in the upper part of the larynx, particularly on the lips of the glottis, and on the inferior surface of the epiglottis; and on introducing the finger, a soft swelling can be felt beneath this cartilage. Perhaps the following sketch exhibits the most complete instance of œdematous swelling of the rima glottidis to be found in collections of morbid anatomy. The patient was brought to the Royal Infirmary labouring under all the



symptoms of the disease in a very aggravated form. Tracheotomy was performed without delay, and with instant relief. The patient fell into a quiet and profound sleep, which lasted for six or seven hours. He started up suddenly and fell down dead; probably the end of the tube had become obstructed by mucus. It is scarcely to be supposed that the patient could have breathed at all with such a state of parts at the top of the air-tube, as here represented. Could any of the swelling have come on in the interval betwixt the performance of the operation and his sudden death? In some instances, the disease rapidly proceeds to a fatal termination, the glottis being speedily and entirely shut by the swelling; in others, the patient lingers for weeks, or even months.

Depletion, local and general, especially the former, if employed on the first appearance of the inflammatory symptoms, will often arrest their progress; but if practised at a more advanced period, it can be productive of no benefit, and if any advantage does follow, it is merely temporary. Sometimes considerable benefit will be derived from the use of blisters, or from the unguentum tartritis antimonii being rubbed on the sides of the neck and over the larynx, so as to produce an eruption of numerous pustules. When all hopes of procuring resolution have passed, and when the urgent symptoms occasionally threatening suffocation supervene, tracheotomy should be performed without delay; and it ought to be borne in mind, that the more early this operation is resorted to, the greater is the chance of success. It has been repeatedly stated, that the disease is confined to the larynx, and, in most instances, to the upper part of it; so that, by making an opening in the windpipe below the thyroid gland, the disease is situated above the incision, the patient breathes through a canal which is in its healthy state, the affected parts are set at rest, and from their remaining comparatively motionless the disease often subsides spontaneously; if not, the various applications to the parts can be employed much more successfully than before; for when the parts remain subject to constant irritation from the movements necessary for respiration and nutrition, all medicines and all topical applications are generally productive of little or no benefit. But if the incision be made into the crico-thyroid membrane, we shall, in most instances, cut into the very middle of the disease; at any rate, the affected parts can be at no great distance from the incision, and the irritation of the tube will be a sufficient cause to excite inflammatory action in parts contiguous to the original disease, and already disposed to assume a similar action; thus the disease may be extended. I have performed tracheotomy on a very considerable number of patients afflicted with œdema glottidis, and I may say, with almost uniform succcess. The disease was speedily subdued, and in most of them there was no great difficulty in closing the artificial aperture, and restoring natural respiration. The relief afforded by the operation is almost instantaneous; the performance of it, if skilful, is attended with no danger; and want of success will generally be found to proceed from its having been too long delayed.

In consequence of laryngitis, or of long-continued irritation in the neighbourhood, the mucous membrane becomes indurated, and subsequently ulcerates; or ulceration may extend from the fauces. In some cases, the ulcers of the larynx are few, and of slight extent; in others, they are more numerous, and of considerable width and depth; and in some there is extensive and uninterrupted destruction of the surface, surrounded by thickened and elevated mucous membrane. This disease is termed *Phthisis Laryngea.* It is characterised by constant tickling cough with expectoration of purulent matter; by pain in the region of the larynx increased on pressure; by great prostration of strength, with general sinking of the vital powers, and frequently by hectic fever. From extension of the ulceration, the vocal chords, the ventricles of the larynx, and the mucous folds forming the rima glottidis, are more or less injured, and frequently altogether obliterated; partial or complete aphonia is the consequence. In phthisis laryngea, especially when advanced, swelling from serous effusion, to a greater or less degree, almost certainly supervenes, the œdema is found in the upper surface of the epiglottis, beneath the mucous membrane, upper and forepart of the pharynx, and occasionally also in the lips of the glottis, — an effect of the contiguous ulceration, — in the same way as œdema glottidis supervenes on ulceration of the lining membrane of fauces and pharynx; the usual train of symptoms denoting phthisis laryngea may thus be interrupted by those of œdema of the glottis becoming (each paroxysm) more and more urgent, terminating in suffocation or relieved by tracheotomy.

From the reasons which have been already stated, inspiration is performed with difficulty, and accompanied with a wheezing and rattling sound, resembling the passage of air through a narrow aperture lined with viscid fluid. Deglutition is difficult; and, from the inactive state of the muscles which naturally close the glottis during swallowing, and from the greater or less destruction of the epiglottis, a portion of the fluid taken by the mouth escapes into the windpipe, produces violent coughing, and is ejected by the mouth or nostrils. As the disease advances, the lungs become affected, the patient is incapacitated for ordinary exertion by the dyspnœa which ensues, he grows weak and languid, and seems, in fact, to labour under phthisis pulmonalis. Not unfrequently the two diseases are combined; but, in the majority of cases, the affection of the lungs supervenes on that of the larynx. Ulcers with tubercular bases are very frequent about the ventricles of the larynx in subjects dead of pulmonary phthisis. The chordæ vocales are thus often exposed. The affection of the lungs is perhaps attributable to frequent and harassing cough, occasioned by the state of the larynx and ejection of profuse vitiated secretions.

When the ulceration extends deeply, portions of the cartilages sometimes become diseased; the soft parts surrounding them are destroyed, they become necrosed, and are expectorated along with a quantity of highly fetid purulent fluid. In some instances, the expectorated portions are osseous, of loose texture, irregular margins, and dark colour, exhaling an odour intolerably fetid. It sometimes happens that the ulcerations proceed still more deeply, perforating the parietes of the canal, and establishing a communication betwixt the windpipe and gullet; or, if the perforation is anteriorly, the communication is with the cellular tissue on the forepart of the neck, abscess forms which may attain a large size and be productive of much inconvenience and danger.

The disease has been frequently produced by mercury, when the abuse of that mineral was common; its abuse is still far from uncommon.

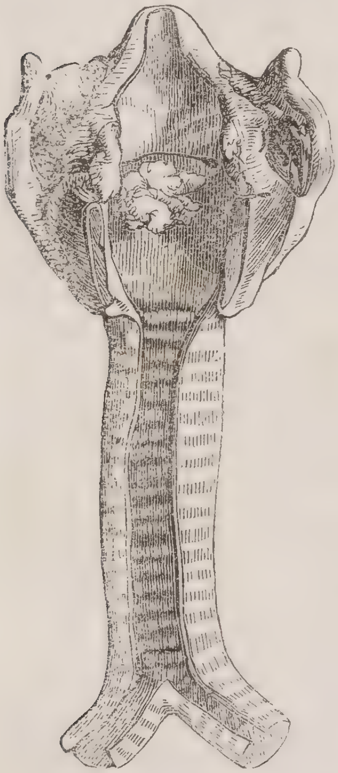
The symptoms may be mitigated by counter-irritation. The parts covering the trachea should not be subjected to counter-irritation; in consequence of repeated blistering, the application of irritating ointments, effusion and thickening of the cellular tissue is caused, and this may prove a serious obstacle in the performance of tracheotomy, should that afterwards, as is too likely, be required. Setons may be inserted on the sides of the neck, and applications made over the box of the larynx. But tracheotomy affords the only hope of permanent relief; and if performed at an early period, if the lungs are not the seat of tubercular disease, as they too frequently are, there is every reason to expect that it will prove successful. It is followed by the beneficial results mentioned when speaking of the preceding disease, and the nitrate of silver can be applied to the more external ulcers, along with the internal use of sarsaparilla, &c. Ulcers, which there is every reason to suppose had been both extensive and deep, have healed even after the discharge of portions of dead, sometimes ossified, cartilage. The symptoms abate; the patient recovers, though in general with imperfect voice, as might be expected.

It may even be practicable to employ topical applications to the ulcers within the cavity of the larynx, as in the following case, which, though unsuccessful, shows the advantages to be expected from similar procedure adopted at a more early period. T. C., aged 22, had laboured under the symptoms of phthisis laryngea for five months previous to his application. He was much emaciated, and experienced great difficulty in swallowing, on account of the irritation induced in the region of the glottis; he had occasional cough, purulent sputa, and aphonia almost complete. The larynx was painful when pressed, the epiglottis was seen to be œdematous, and the general symptoms were of a hectic character. The œdema of the epiglottis was reduced by scarification.

The symptoms increased, notwithstanding counter-irritation and tonic remedies. The stethoscopic indications regarding the chest were so far favourable.

Tracheotomy was performed, and the patient felt very much relieved in consequence. On the tenth day after the operation, the inner surface of the larynx was touched with a strong solution of the nitrate of silver, applied by means of a bit of lint wrapped round the end of a probe slightly bent, and introduced upwards from the wound. The solution was applied every second or third day, and under its use the patient was remarkably benefited. He swallowed, spoke, slept, and looked better; the purulent sputa diminished, and the cough abated. He complained of less pain in the larynx, and seemed to be regaining strength, though slowly.

But after the lapse of several weeks, from imprudent exposure to cold, evident symptoms of bronchitis supervened, under which his constitution already shattered, speedily sank. The larynx was found extensively ulcerated, but at a number of points there were distinct marks of recent cicatrisation. The state of the lungs clearly showed that phthisis pulmonalis had not only commenced, but made considerable progress. The practice here detailed has been repeated again and again with good success.



Dyspnœa is caused by other circumstances besides those already mentioned; some rare cases are met with in which warty excrescences have grown from the seat of the vocal chords: a beautiful specimen from the collections of my friends, Messrs. Grainger and Pilcher, is here delineated. Dyspnœa frequently arises from paralysis of the muscles of the larynx, in consequence of effusion at the base of the brain, from long-continued irritation, as from an irritating cause seated in the mouth, and in old people from a general decay of the animal powers. In the last case, it is generally a symptom of approaching dissolution, as is the dysphagia which often attends it.

Severe dyspnœa is sometimes caused by external violence. A fine healthy child, aged eight, in running across the street, fell, and struck the larynx with great force upon a large stone. She was taken up quite lifeless, and some time elapsed before respiration was at all established. A gentleman finding her face livid, opened the temporal artery, and applied leeches to the throat, with some relief. I saw her about three hours after the accident. The breathing, inspiration more particularly, was exceedingly difficult; and this appeared to proceed not only from the injury to the larynx, probably occasioning loss of power in the muscles, but from the collection of some fluid in the trachea and its ramifications. The child was evidently in such a state that, unless active measures were resorted to, and that speedily, a fatal termination would soon take place. Tracheotomy was performed; a quantity of coagulated blood and bloody mucus was evacuated from the opening; and when the discharge and coughing had ceased, a tube was introduced. In eight days the tube was withdrawn, the aperture closed; and no unfavourable symptom recurred. In the museum at Chatham is a larynx showing fracture of the thyroid cartilage from the kick of a horse. The immediate consequence was great difficulty of breathing and rapid general emphysema. The patient, a young soldier, died soon after the injury.

Large or irregular *foreign bodies*, as coins, pebbles, portions of stone or of coal, seeds of fruit, &c., put heedlessly into the mouth, are apt to become impacted in the rima glottidis, and give rise to severe and dangerous dyspnœa, or even cause sudden dissolution. Smaller and smooth substances pass through into the trachea. Such accidents happen most frequently to children. Peas, beans, small shells, &c., slip into the air-passage, are obstructed for a short time in the rima, but are soon forced by the convulsive actions of the patient into the trachea, and frequently lodge in the right bronchus, it being more capacious, and more a continuation of the trachea than the left; or they remain loose in the trachea, and are moved up and down by the passage of the air. Immediately on their introduction, most violent coughing takes place, respiration is convulsive and imperfect, the patient writhes in agony, and is in dread of instant suffocation; the countenance becomes inflated and livid, and most strenuous efforts are made by nature to expel the foreign body. At length he is exhausted, and an interval of perfect quiet ensues; but this is soon interrupted by renewed attempts at expulsion. After a time, the intervals of repose increase in duration, and in many cases are so long continued, as to lull the patient and his friends into a belief that the windpipe contains no extraneous substance. But still violent fits of coughing supervene from time to time, and the dyspnœa is very alarming; on attentive examination, the presence of this foreign body may be ascertained beyond doubt by the peculiar noise produced by its movements in the passage; at the same time, thin mucus is copiously discharged from the lining membrane. Occasionally the foreign body becomes so placed in the canal as to form a complete valve, and then the labours of the patient to dislodge it are most painfully severe; if they fail, he is suffocated. During laborious breathing the neck sometimes becomes emphysematous. The parts may at length get accustomed to the presence of the foreign body, and all uneasiness subside. But danger, though not immediate, still remains. Foreign bodies have remained for years without causing much inconvenience; but in such cases they have generally settled in some remote ramification of the bronchial tubes; abscess commonly, sooner or later, takes place around, purulent expectoration follows, all the symptoms of pulmonary phthisis are established, the patient becomes hectic, and dies.

The existence of the foreign body, when suspected, is to be ascertained by accurate and attentive examination along the forepart of the neck, and by listening carefully to the sounds which may be present in the trachea; but the urgency and continuance of the symptoms will seldom leave the surgeon to entertain a doubt. If he attentively watch the patient, he can scarcely be mistaken. It has been recommended to examine the œsophagus previously to adopting active measures, a large foreign body impacted in that passage being capable of materially obstructing respiration by compression of the trachea; and it is safe and prudent to follow this recommendation whenever the least uncertainty exists regarding the real nature of the case.

When a foreign body has lodged in the windpipe, tracheotomy should be had recourse to without delay. In general, the offending substance presents itself immediately after the division of the trachea, and is expelled by a strong current of air. But in some cases it may be necessary to introduce instruments — probes, scoops, or small forceps — upwards or downwards, to dislodge and extract the body. A case in which a foreign body, which had lodged in the right bronchus for about six months, was successfully extracted, is detailed fully in the *Lancet*, and noticed shortly in the *Practical Surgery*, p. 416. A little blood from the wound may cause coughing for some minutes, but this soon ceases; the wound is closed after a few hours, respiration is completely reëstablished, and all that the surgeon has then to combat are the evil effects on the mucous membrane which the contact of a foreign body may have occasioned.

Tracheotomy is, in nearly all cases, preferable to laryngotomy. In disease of the windpipe, as formerly stated, it is better to cut into a sound part of the passage, or at least as far as possible from the seat of the disease. When an adult, for example, labours under acute laryngitis, the effused lymph is generally confined to the larynx, as was already mentioned; an opening below the thyroid gland is removed from the effusion, and by means of it the patient breathes through the natural tube yet sound; whereas, if the opening is made in the crico-thyroid membrane, the surgeon frequently cuts into the middle of the diseased part; little or no benefit follows, and, if the danger is not increased, equivocal good is all that can be expected from such an operation. Tracheotomy is also preferable for the removal of foreign bodies, unless it is certain that the body is impacted in the rima, for in such circumstances laryngotomy is much more suitable. In tracheotomy, the incision of the tracheal rings can be extended with much less injury than can division of the laryngeal cartilages, when the largeness of the foreign body, its being firmly fixed, or other circumstances, require that the wound be of considerable size. The risk or danger in the one operation is not much greater than in the other. Division of the crico-thyroid membrane and skin is effected by one incision; there is nothing important in the way of the knife. In very young children, when suffocation is threatened, as from the effects following upon the attempt to swallow very hot fluids, and the inhalation of steam, this operation may with great propriety be performed. Tracheotomy, on the contrary, requires to be proceeded in more carefully, particularly in children, in whom the neck is short, and the trachea deep. The tube is moreover very small, and not easily steadied. I had occasion, not long since, to open the passage in a child under sixteen months old, who had tried to swallow the contents of a teapot recently filled with boiling water. The difficulty experienced in such cases is often very great.

Obstacles may also be presented by the thyroid and other veins being distended, and the soft parts are perhaps tumid and infiltrated with serum.

The patient, if adult, should be seated with the trunk erect, and by throwing back the head, space in the neck is gained. In a female on whom I operated some years since, this advantage could not be obtained on account of induration in the belly of the sterno-mastoid muscle, with contraction. The incision of the integument is commenced in the mesial line over the cricoid cartilage, and carried downwards, an inch in the adult, but proportionally shorter in children. The cellular tissue is divided by a few touches with the point of the instrument (a small scalpel or bistoury); the finger is then introduced to separate the sterno-hyoid muscles, and to feel for any stray vessels which may be in the way; for the thyroid arteries sometimes cross the line of incision, and it may happen that some of the larger arteries of the neck, by following an unusual course, become liable to injury, if the operation were rashly performed. The plexus of veins on the forepart of the neck is pushed downwards, and the isthmus of the thyroid gland, if it exist, is displaced slightly upwards; thus the rings of the trachea are cleared. The patient is desired to swallow his saliva, in order to elongate and stretch the windpipe; and the surgeon, seizing the favourable opportunity, pushes the point of the knife, with its back towards the top of the sternum, into the tube at the lower part of the incision. The instrument is carried steadily upwards, so as to divide three or four rings. It is not at all necessary to cut out any part of the rings of the trachea as recommended by some writers; contraction of the tube may afterwards result; nor can any good purpose be served by making the opening crucial.

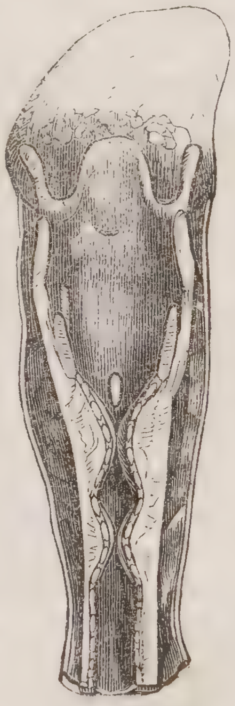
If the operation has been undertaken for the removal of a foreign body, its object is usually accomplished immediately on division of the rings; if not, the substance must be dislodged by proper instruments, as was previously remarked. The opening is allowed to close after the oozing of blood has entirely ceased; but its edges must be kept asunder till then, lest the blood be drawn into the bronchial tubes, which occurrence, however slowly it take place, is always dangerous. The union and cicatrisation of such longitudinal wounds are soon accomplished; they close permanently in a few days, even after having been open for many weeks with a foreign substance interposed between their edges. The same obstacles do not interfere as in transverse wounds; on the contrary, every circumstance is in favour of rapid union.

When the object of the operation is to relieve respiration, impeded by disease in the superior part of the canal, a silver tube, of convenient curve, length, and calibre, is introduced into the wound immediately on the knife being withdrawn, and secured by tapes attached to the rings at the orifice of the tube, and tied round the neck. Frequently a violent fit of coughing, alarming to the patient, follows the introduction, in consequence of some blood having entered the trachea. But on the ejection of some frothy mucus, mixed with blood, the patient becomes quiet and tranquil, breathes easily, and feels composed and relieved. The form of the tube — the calibre gradually increasing from below towards the orifice — completely prevents any farther ingress of blood, by the uniform compression which it makes on the edges of the wound. The secretion of mucus in the trachea is increased by the presence of the foreign body, but the patient easily frees himself from its annoyance, being instructed to place his finger on the orifice of the tube, so as to narrow the aperture, when he wishes to cough and expectorate. In those cases where the operation has been performed without there being diminution of calibre of upper part by swelling or otherwise, expectoration through the tube is more difficult. Mucus, however, is apt to adhere to the inner surface of the tube, and thereby obstruct breathing; to prevent this, it is necessary occasionally to introduce a feather, or a probe wrapped round with lint, for some hours after the operation; the attendance of an assistant may be necessary for this purpose, but the patient readily undertakes the duty himself, on being made aware of its necessity. A double tube has been recommended, to facilitate the keeping of the passage clear, the inner one being occasionally withdrawn, cleaned, and replaced. But this is not in ordinary cases necessary. The frequent introduction of a feather, or probe, is sufficient for some hours after the operation, and in a very short time the patient finds that he breathes freely, though the tube is removed for a few minutes, in order to be cleaned. At first, a funnel-shaped tube is used, to compress the edges of the wound and prevent oozing, as already mentioned; afterwards, one of uniform calibre is more easily coughed through. The patient should be kept in an atmosphere of warm and equal temperature, and it is also prudent to place some cloth of very loose texture over the tube, that the temperature of the respired air may resemble as much as possible that passing through the whole track of the windpipe; thus bronchitis may be averted.

In some cases, the necessity for continuing the tube speedily goes off, the larynx, in consequence of rest, having recovered its healthy state and action. After eight or ten days, on taking out the tube, and closing the aperture in the trachea, the patient breathes and speaks well, and continues to do so.

In other instances, the difficult breathing recurs soon after withdrawal of the tube, the morbid state of the laryngeal mucous membrane having not been wholly removed. In such circumstances, the tube must be replaced and continued, but a smaller one suffices, less mucus is secreted, and a considerable quantity of air passes through the larynx; in short, the patient requires merely a small tube to obviate the danger which might arise from complete closure of the artificial opening, and to compensate for the narrowness of the natural canal. He speaks tolerably well, on placing his finger over the orifice of the tube. In course of time, the larynx may recover, and the tube be no longer necessary.

In some cases, a tube of a certain size must be worn during the remainder of life; and it does not generally cause much inconvenience. Attempts to discontinue its use give rise to dreadful suffering; the difficult breathing, threatened suffocation, and horrible feelings during the night, all recur. The box of the larynx has fallen in, as it were, in consequence of having been long disused, and is unable to resume its functions to their full extent. Besides, great, though gradual, change of structure has in all probability taken place. In several such cases, I have attempted to restore the natural dimensions of the passage, by the occasional introduction of bougies, gradually increased in size; but in none have I completely succeeded, except in the case of attempted suicide which has been already detailed shortly. In all, my attempts were at first followed by encouraging amelioration, but untoward symptoms occurring forced me to abandon them, though repeatedly persevered in. In one man, I succeeded in restoring natural respiration and closing the opening in the neck, but this was not of long continuance; a fresh accession of difficult breathing made renewal of the artificial opening absolutely necessary within a few months. Still the results are not such as to forbid further trials; and at any rate, it is now well understood that much greater freedom may be safely used with the air-tube than was formerly imagined; yet it must be acknowledged that little benefit can be expected to follow such, or any treatment, in many cases of contraction of the canal, from long-continued disease. The larynx and trachea obtained from the patient whose case is alluded to above are here represented. The poor fellow had worn a small silver tube in an opening in his windpipe for many years. It was originally introduced on account of long-continued disease of the larynx, with dreadful suffering and constant sense of impending suffocation. He could not be made to dispense with the tube entirely, as he felt immediately on the wound closing a threatening of return of his painful and dangerous symptoms. A small one was substituted for that at first used. He led a very irregular life, used a vast quantity of opium, and no small amount of spirituous liquors. He used to be out in the open air occasionally all night, and suffered repeatedly under attacks of bronchitis. He was under treatment again and again in the hospital, on account of rheumatic affection and deranged digestive organs. He used occasionally to present himself, complaining of difficult breathing, and stating that his silver tube was too short. He could articulate tolerably well when he stopped with his finger the orifice of the silver tube; at all times a part of the respired air passing through the natural channel. Latterly, he used to suffer from threatening of suffocation, and he used to relieve himself of the cause of this, viz., the inspissated and ropy mucus which got entangled in the trachea, then not suspected to be in a diseased state, by pushing through the opening in his neck and into the bronchi, long turkey's feathers; of these he carried a good store, and some are now in my possession. This feat he performed without causing the slightest excitement or coughing. Ultimately, and about twelve years after the operation had been performed, he died, principally from diseased viscera. His liver was enormously enlarged



and altered in structure; the larynx is seen to be very much contracted at two points. The tube is observed to be considerably dilated below the contractions.

The introduction of tubes into the larynx has been supposed likely to supersede bronchotomy in some cases; and it is said that their presence does not produce so much irritation as has been stated. But the practice must, in all cases, be most troublesome to the surgeon, and painful to the patient; and, in my opinion, continuance of it is in the great majority of cases impracticable. Besides, it is difficult, and not unattended with danger. Bronchotomy is quite safe, and not likely to be followed by such suffering to the patient, or by any other unpleasant consequence, to which the other method is liable.

Pharyngitis. — Inflammation of the pharynx is of rare occurrence. The inflammation may extend from neighbouring parts, or be produced by the direct application of an irritating or stimulating cause, as the lodgement of foreign bodies, of pins, fish-bones, seeds, portions of hard food; or by the application of acrid fluids to the membrane, acids, hot water, &c. In one instance which I met with, it occurred in a very violent form, in consequence of a large and sharp portion of an earthenware plate having been swallowed so far by the patient whilst eating his porridge, and becoming firmly impacted in the lower part of the pharynx. I have seen a considerable number of instances in which the disease was produced by the swallowing of soap lees, a fluid, it would appear, highly acrid, occasioning a severe degree of inflammation, and even destroying a portion of the parietes.

A man employed by the police in fumigating houses during the prevalence of cholera, had given to him as a practical joke a glass of sulphuric acid instead of whiskey. He suffered at the time, as may be supposed, most excruciating pain, violent inflammation supervened, followed by a bad stricture of the gullet.

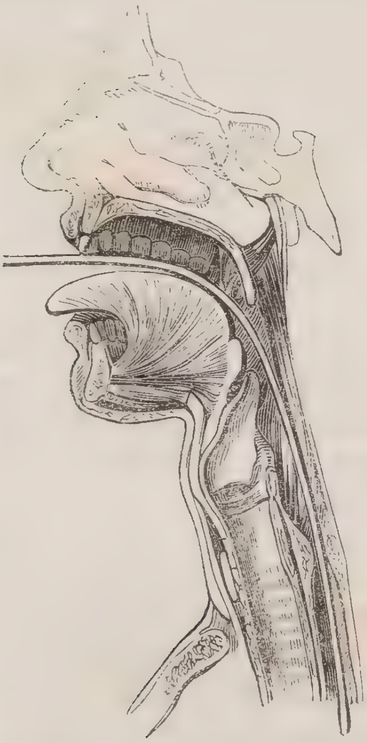
Deglutition is difficult and painful; an exquisite degree of pain is occasioned by pressure on the sides of the neck, and the circulation is more or less excited. Redness and swelling of a portion of the mucous membrane can be observed on looking into the fauces. The changes which occur in the membrane are similar to those produced in the windpipe by inflammation.

Resolution will generally be effected by the application of leeches to the neck, the exhibition of purgatives and diaphoretics, and strict observance of the antiphlogistic regimen.

If the inflammation does not soon subside, it sometimes happens that constriction of the passage occurs, either from thickening or œdematous swelling of a portion of the mucous membrane, or from effusion of lymph, and adhesion of the opposed surfaces. The common seat of stricture, as in other mucous canals, is that portion of the tube which is naturally the narrowest, the lower part of the pharynx and commencement of the œsophagus, immediately behind the cricoid cartilage: occasionally it takes place in other parts of the canal. In general, the contraction is of small extent, and unaccompanied with much thickening around. The tube immediately above the constricted point is more or less dilated, and often to so enormous a size as almost to resemble a first stomach. In the majority of cases, the parietes of this pouch are attenuated; but occasionally they are much thickened, and the seat of a purulent collection, which subsequently opens into the general cavity. In cases of long standing, ulceration often occurs, usually limited to the neighbourhood of the stricture. When the parts immediately below the stricture are ulcerated, the circumstances is often attributed to the retching which generally attends the disease; but it appears to be the result of morbid action, seated in the parts themselves, similar to the ulcerative process in the larynx following inflammatory affection. But ulceration occurs as frequently above the stricture as below it; and, besides the natural cause to which it is referable, is often produced, or at least aggravated, by injudicious or unskilful attempts to remove the constriction. Though the ulcers seldom enlarge to any great extent, yet, in some rare cases, a portion of the parietes of the canal is perforated, and a communication thus established with the trachea, or with the cellular substance amongst the muscles of the neck. Or the ulcers, from either long continuance, or inherent disposition, may assume a malignant action, extend rapidly in both width and depth, throw out fungous and unhealthy granulations, form sinuous false passages, and produce a most horrible and intractable disease. But strictures are often of temporary duration, and appear to depend on spasmodic contraction of the circular muscular fibres of the tube. And dysphagia may also arise from an opposite condition of the fibres — from paralysis, in consequence of cerebral affection, a fatal symptom in any disease.

The prominent symptom of stricture of the œsophagus is difficult deglutition. Some patients can swallow only liquids; and when an attempt is made to get over any solid substance, this is stopped at the contraction, and completely obstructs the passage. In such cases patients will frequently apply for relief, in order that the portion of food may be pushed through the narrow portion of the canal; with the accomplishment of this many are quite satisfied, and are unwilling to submit to farther treatment, obstruction to solid matter being the only inconvenience experienced. But when contraction is great, and the involved portion of the canal almost obliterated, little food of any kind can pass into the stomach, the patient becomes feeble and emaciated, and ultimately dies from inanition. The subjects of this affection are generally far advanced in years, and in them it often occurs without any evident cause.

If pharyngitis have subsided, either spontaneously or after antiphlogistic treatment, and symptoms of stricture supervene, the existence or non-existence of this latter disease must be ascertained by gentle and cautious introduction of a gum-elastic bougie or ivory-ball probe. If stricture exist, the descent of the instrument will be resisted at the contracted point, and most frequently at the lower part of the pharynx: this, in the adult, will be at a distance of about nine inches from the incisor teeth. When the seat of the stricture is ascertained, a bougie is to be introduced, sufficiently small to pass through it; and when this has been pushed beyond, the disease, if unattended with malignant disposition or action, is completely in the power of the surgeon. After sufficient time has been allowed for the irritation following the first introduction to subside, a larger bougie is to be passed, and retained as long as its presence can be endured. This practice must be continued, till, by gradual increase of the bougie, the canal is dilated so as to admit readily an instrument sufficient to distend the gullet in its healthy state. Thus the passage will be gently and gradually dilated, till it regain its original calibre. The process is partly mechanical, but also greatly dependent on vital action; by the presence of the bougie the parts are stimulated, the fluid, which may be effused beneath the mucous membrane or into its substance, is absorbed, and the new solid matter is also gradually removed by increased action of the absorbents. But if the bougie be rudely and forcibly introduced, or too long retained, the absorbent action from being salutary becomes morbid, and ulceration is established, which may proceed to destroy the parietes of the canal, so producing an additional and equally formidable disease; or if the ulcerative action subside, the parts will cicatrise and consequently contract, so giving rise to a new stricture, and narrowing the canal to an equal or greater extent than formerly. Before introducing the bougie, the head must be thrown as far back as possible, as here seen, and brought to a horizontal position, that the natural curve of the upper part of the canal may be lessened, and the passage of the instrument thus facilitated. It is of consequence also to keep the point of the bougie pushed back towards the vertebræ (the patient being desired to make an effort to swallow), and to grasp the larynx with the left hand and pull it gently forwards, that there may be no risk of the instrument passing into the windpipe, instead of into the gullet; if such a mistake should happen, the surgeon will soon be apprised of it by the violent and convulsive coughing which is generally induced, though not always. Bougies armed with caustic have been recommended, but are unnecessary, the simple bougie being sufficient to remove the disease, if skilfully employed; besides, their use is not unattended with danger. ulceration being frequently produced. In very bad cases, in which the stricture is long in yielding to the means already mentioned, and the nutriment which the patient is able to swallow is necessarily small, — when the canal is altogether obliterated either at one point or to a considerable extent, as has sometimes happened, and when there is consequently little hope of success from any treatment — the strength of the patient may be supported, and life prolonged for some time by the use of nutritive enemata.



Dysphagia may also be caused by tumours in the œsophagus; but as these are generally of a medullary structure, and consequently endowed with malignant action, the treatment can only be palliative — there is no hope of a radical cure.

Dysphagia may arise from an aneurismal tumour of the arch of the aorta, or of the large arterial trunks passing off from it, pressing on the œsophagus, and so narrowing its calibre. In such cases, also, no hope of success from any treatment can be entertained; often the case terminates fatally in a very sudden manner, in consequence of the aneurismal tumour giving way at the point which protrudes on the gullet; the contents are discharged into the stomach, or ejected by the mouth. If treatment by bougies be attempted in dysphagia arising from such a cause, the practitioner not being aware of the nature of the disease, the fatal issue will be fearfully hastened — a very unpleasant consequence of any practice.

Foreign bodies lodged in the œsophagus produce difficult deglutition, and, if large, may obstruct the passage completely; much irritation is also caused to the parts with which they are in contact, and inflammatory action kindled in them. A large substance firmly impacted likewise creates difficulty of breathing, by compressing the posterior part of the trachea. Indeed every consequence is of such an annoying nature, as to render dislodgement and removal of the offending substance necessary, though there were no apprehension of danger from its long-continued presence. The proceedings must be varied according to the consistence, form, size, and situation of the foreign body. There are a great many instruments for effecting dislodgement and extraction, but the great majority of them are more curious and ingenious than applicable to the purpose intended; few are of any use. A probang, mounted with a bit of sponge, or with an ivory-ball — a blunt flat hook attached to a whalebone probe — and long curved forceps, constitute the whole useful apparatus. The feelings of the patient are generally sufficient to mark the position which the body occupies; he is made to throw the parts into action, by attempts to swallow the saliva, and during the attempt to point to the seat of pain. But by this both patient and surgeon may be deceived, for pain and a feeling of foreign matter being lodged often remain at a fixed point, after the body has passed down; similar deception occurs in other situations, as in regard to extraneous substances in the eye, urethra, &c.

Small and sharp substances seldom remain long in the œsophagus, but readily descend into the stomach and intestines; they then either escape along with the feces, or, as sometimes happens, penetrate the parietes of the alimentary canal, generally near its termination. On leaving the stomach or the intestines, by gradual perforation, they frequently travel great distances in the trunk or limbs, without causing much inconvenience, — effusion of lymph surrounding them, and filling up their track. They will appear, long after their insertion, at a far distant point, approach the surface, and gradually make their way through the integument, or be readily extracted. When they enter from the surface, also, they often come within reach long afterwards, and far from their point of entrance.

Needles, thus travelling, become oxidised. They are easily removed, on coming near the surface, by fixing them with the fingers, and making a small incision over the more superficial extremity. A needle may sometimes be taken out, by making pressure on both ends, and so forcing the point through the integument.

Small pointed bodies, needles, pins, fish-bones, &c., often get entangled in the root of the tongue or in the folds of the palate; on opening the mouth they can be seen, and are easily brought away. If lodged in the pharynx, they can be reached by the finger. The patient is seated with the head thrown back, and the jaws extended; the finger is introduced with determination, regardless of attempts to vomit, and swiftly passed into all the sinuosities by the side of the epiglottis, into the pouches betwixt the os hyoides and cornua of the thyroid cartilage, so that no part is left unsearched. The substance, when felt, may be extracted with the finger by entangling it in the point of the nail; or curved forceps may be introduced, and applied conveniently to the body by the guidance of the finger. Great care and caution is required in dislodging the foreign body, when both ends, as is often the case, have penetrated the parietes; if it be rudely grasped and pulled, the parts are lacerated; or it breaks, and the surgeon, after bringing out the portion held in the forceps, may find great difficulty in detecting and disentangling the other. I have often found it very troublesome to remove delicate needles entire. When they are beyond the reach of the finger, it is of no use to attempt their removal; the patient suffers great pain during the endeavour, and there is no chance of successful issue; besides, the surgeon is apt to bring discredit on himself.

Coins may be removed by the forceps, or by the hook, if lodged at the narrow part of the passage behind the cricoid cartilage; if lower, they generally defy attempts at extraction, and slip into the stomach gradually. Halfpennies, halfcrowns, &c., pass readily along the alimentary canal, and are voided in a short time.

Tendinous or cartilaginous portions of hard meat, when within reach of the finger, can be laid hold of by the curved forceps, and pulled up. Smaller and soft portions, if impeded in the passage, as when it has been narrowed by previous disease, are dislodged and pushed down by the cautious use of a small probang or œsophagus bougie. In the introduction of any instrument, attention should always be paid to the steps advised when treating of stricture of the gullet.

Œsophagotomy is an operation that may, under some peculiar circumstances, be required. When a foreign body is of such a nature that, when once lodged in the gullet, it cannot be removed either upwards or downwards, without serious læsion of the parts, and, when breathing is impeded by its projection, incision of the œsophagus may be warrantable. The operation is easily accomplished. An incision of about three inches is made in the superior triangular space of the neck, on the left side, — the gullet usually inclining to the left of the mesial line. It is commenced opposite to the os hyoides, and carried downwards parallel with the trachea; the use of the knife is continued till by cautious dissection the wound is brought to the level of the common sheath of the large vessels. Assistants separate the edges by thin and broad copper spatulæ, and the cavity is frequently sponged. The larynx is pulled aside, and turned a little over on its axis; the pharynx is thus exposed. During the latter part of the dissection, the laryngeal nerves and thyroid arteries must be looked for and avoided. The foreign body is felt through the parietes, and these are laid open to an extent sufficient for its extraction. It is advisable to nourish the patient for some days afterwards through an elastic tube passed by the mouth or nares into the gullet, with its extremity one or two inches beyond the wound. Its introduction requires caution; an instance is on record of a tube being passed with the view of conveying nourishment, in which the surgeon did not discover that its extremity had slipped into the larynx till after the injection of some fluid. It is recommended to wait for some minutes before proceeding to inject, and that, if during that time no air pass through the tube, the instrument may be considered certainly in the œsophagus. It is seldom that the opening of the œsophagus will close by the first intention, and therefore accurate approximation of the external wound need not be attempted.

Removal of noxious matter from the stomach is now successfully practised by the aid of instruments. This is required when the excitability of the organ has been impaired or destroyed, and emetics in consequence do not act.

It is unnecessary here to treat of the emetics which act most quickly, or which are most proper in different cases, nor of antidotes for various poisons. Many stomach-pumps have been contrived, and their merits have caused much rivalry; but they are all constructed on much the same principle. People, too, seem to indulge the inventors by swallowing deleterious substances much more frequently than before. There has been a demand for cases of poisoning, and the supply has kept pace pretty well with the demand. Now-a-days twenty seem to attempt suicide by poison for one that did so long ago.

Most vegetable narcotics — those which do not act with great rapidity, can be removed mechanically; but some of the mineral poisons are heavy and difficult of solution, and are not so readily extracted. Read's apparatus appears to me the simplest and the best, for this and various other purposes. Ample directions for its use are given along with the instrument.

Inflammation and Abscess of the Ear are either deep-seated, or confined to the external meatus. Suppurations in the internal parts — in the cavity of the tympanum, or in the mastoid cells — are often attended with the most violent symptoms, excruciating pain, fever, delirium. Such are highly dangerous in their consequences. Collections nearer the surface, under the membrane lining the meatus, are, though not so dangerous, also attended with great suffering and severe constitutional symptoms. The disease may occur at all ages, but is most common in children during dentition; in them it is often accompanied with convulsions and head symptoms, leading to a suspicion of hydrocephalus being established. The symptoms are all much relieved on the occurrence of copious purulent discharge.

Suppuration in the organ of hearing often follows eruptive diseases; and both ears, or one, may continue to discharge for a long time. There is always more or less derangement of the functions of the parts. When the disease is external, perhaps hearing may not be much affected; but when, as often happens, the ossicula, nervous expansions, membrane, parietes, are all destroyed or injured, hearing is lost, or rendered at least very obtuse. Purulent discharge often continues for the rest of the patient's life, at one time scanty, at another profuse, and preceded or accompanied by inflammatory symptoms. Openings form over the mastoid process, communicating with the cells; and these are often connected with abscess betwixt the dura mater and pars petrosa of the temporal bone. Abscesses, too, of the middle lobe of the cerebrum, or in the cerebellum, are sometimes evacuated through the meatus auditorius. In all cases, but in the last more particularly, the patient suffers extremely on the discharge being suppressed, and is again relieved on its recurrence. At length, fever and delirium may supervene, terminating in coma and death; I have dissected many who have perished in this manner. Or, after long-continued discharge from the meatus, perhaps with paralysis of one side of the face, a soft tumour of the dura mater will be found lying over the pars petrosa, having caused extensive absorption of the bone, and exposed the semicircular canals, cochlea, tympanum, &c., filled with purulent matter. Abscess of the tympanum itself discharges long; and large, flabby, soft granulations fill up the meatus, very different in appearance from the solid tumours which sometimes occupy that situation.

Ordinary earache — inflammation extending along the meatus externus, and confined to the lining membrane — will be relieved by leeching behind the auricle, and by assiduous and regular fomentation afterwards. But suppuration is seldom prevented. The abscess may sometimes be opened, with great relief. If deeply seated, the parts are soothed by fomentation and poultice, till spontaneous evacuation of the matter occurs; this is then to be washed away, from time to time, by the injection of a warm and bland fluid; the abscess gradually closes, and the discharge slowly disappears. In cases of long-continued discharge, it is generallly impossible to ascertain from what depth the matter comes, and there is always great risk in using means to arrest its flow. The patient must submit to the annoyance. The discharge can be moderated, or altogether suppressed, by injections of astringent salts, but the practice is unsafe, and in most cases unwarrantable. The parts are to be kept clean by frequent ablution with tepid water, lime water, or other bland fluids; and cotton or wool may be worn in the meatus to take up the discharge, and prevent bad effects from cold. Discharge from the external meatus, and about the auricle, is often kept up by irritation in the mouth, in both children and adults; this should be looked to, and the offending cause removed, if possible.

Foreign bodies are frequently lodged by children in the meatus auditorius externus — peas, beads, shells, shot, pins, &c. By awkward attempts at removal they are pushed deep into the cavity; and the membrane of the tympanum is sometimes broken, as indicated by effusion of blood, and swelling of the parts. Violent inflammatory symptoms may be caused by such substances, and will be seriously aggravated by unsuccessful attempts at extraction. Sometimes they are allowed to remain for days or weeks; in such circumstances seeds swell, separate, and begin to throw out a germ, thus fixing themselves more firmly in the passage. They are easily removed at first, by a small silver scoop, of convenient size and form; and even at a later period, a determined, though not forcible, attempt with the instrument will be followed with success. The scoop is gently and gradually insinuated betwixt the membrane and foreign body; and on its handle being then raised the body is extruded. It is seldom that any excitement follows extraction by this method: but if large and powerful instruments be introduced, and force applied, the parts may sustain severe injury, and troublesome consequences ensue: indeed such proceedings have proved fatal.

Foreign bodies are also occasionally impacted in the nostrils: the procedure above described is to be adopted. Sometimes they are discharged by the posterior nares during attempts at extraction.

Polypus of the meatus auditorius externus is generally of pretty firm consistence, pyriform, sometimes slightly lobulated and warty-looking; it adheres by a narrow neck to the parietes of the tube near the margin of the membrana tympani, is attended with slight discharge, and with deafness to a greater or less extent.

Extraction is the only means of cure. The body of the tumour is depressed and pulled outwards by the flat end of a probe slightly bent; delicate forceps are introduced gently, and passed up to the neck of the polypus, which is then firmly grasped; by combining slight twisting with gentle extractive force, it is readily removed. Or a flat scoop, with a sharp round edge, is passed along till obstructed, and by slight rotatory motion of the edge, the neck of the tumour is divided. After a day or two, a mild escharotic may be applied with the view of preventing reproduction; a bit of charpie sprinkled with the oxidum hydrargyri rubrum may be pushed up to where the tumour was attached, and the application may be repeated several times, one or two days intervening. Even after this the tumour sometimes returns, again rendering extraction necessary.

Deafness is attributable to various causes besides those already mentioned. Accumulation of cerumen in the external meatus is the most common. The cerumen is often mixed with wool, and other extraneous substances, which the patient may have been in the habit of introducing as preservatives from cold, and thus a large and firm plug is formed, completely blocking the meatus. It is removable by the assiduous injection of tepid water, the best solvent of cerumen. The whole may not be brought away at the first sitting; but the injection must be repeated again and again, till the membrane of the tympanum is free. A powerful syringe is required. By the use of a speculum, the condition of the external tube and membrane of the tympanum can be ascertained. But it is perhaps unnecessary to enlarge farther here on this subject, for such is the division of labour in these days, that a distinct profession is founded on the operation of squirting water into the external ear; it is true that other operations are talked of by these Aurists, as they style themselves, but the advantage to be derived from any of them is often very doubtful. They talk of deafness as arising from a deficient secretion of cerumen, from dryness, or from eruptions in the meatus; and heating stimulant applications are poured in — oils, ointments, mercurial salts, acetic acid, garlic, &c., all combined. They even go so far as to recommend mercurials to correct the state of the general health, to improve or rectify the functions of the chylopoietic viscera, the assistant chylopoietic, and the whole of the digestive organs, upon derangement of which, say they, many cases of deafness depend. The fools who apply to such charlatans certainly deserve to have their pockets well drained, but ought scarcely to be poisoned by them.

It has been proposed to pass probes and tubes into the eustachian tubes, to reëstablish their continuity if obliterated, or dilate them if partially closed. No doubt deafness often depends on obstruction of this outlet from the tympanum, the requisite reverberation being perhaps thereby impeded. It may be closed by swelling of the lining membrane, by inspissated mucus, by destruction of its extremity from ulceration, by the cicatrisation of ulcers in the immediate neighbourhood, by congenital deficiency, or by pressure of neighbouring swellings, or of morbid growths, producing temporary or permanent obstruction. None but the first two causes could possibly admit of the use of the probe, and even then it can scarcely be required. By removal of the cause of such turgescence at the end of the tube, or in the neighbouring parts,—which can often be detected, being local, — by counter-irritation, &c., a cure is much more likely to be effected than by the introduction of probes. Not that the operation is exceedingly difficult; for, after practice on the dead body, a probe can readily be passed into the eustachian tube of the living from the nostril. The instrument is fixed in a handle, with its point slightly bent, and on the handle there should be a mark to show the direction of the point; the distance of the termination of the tube from the nasal orifice ought also to be marked. The instrument is passed along the floor of the nostril, and then its point is directed upwards and outwards, whilst the handle is pressed towards the septum narium. It has been proposed, moreover, to force a stream of cold and condensed air into the internal ear, and to apply ætherial vapours to the cavity of the tympanum. The attempts have been made on an extensive scale in all sorts of cases, and quite indiscriminately. This plan of curing deafness has been well advertised, and unblushingly puffed in scientific and other journals. Not one case of deafness in a hundred probably depends upon any affection of the eustachian tube: vitiated mucus cannot even be displaced by injection of air or other fluid, unless the membrane of the tympanum be ruptured; this has indeed been accomplished by the operation in question, and then the mucosity could only be forced into the cavity of the tympanum, so as, if possible, to make matters worse.

Nervous deafness, like functional amaurosis, may sometimes be relieved or even removed entirely by stimulating frictions, or the application of strychnine to a raw surface behind the auricle, and by attention to the general health.

Puncture of the Tympanum has been recommended as a remedy for deafness arising, or supposed to arise, from obstruction of the eustachian tube; but I believe it has not succeeded in above one out of twenty cases. The puncture is apt to close very soon; and though the hearing may be improved for a short time, the advantage gained soon disappears. The means of keeping the puncture open are not easily applicable; perhaps the most effectual is to touch the edges occasionally with pencil-pointed lunar stone. The puncture is generally made with a short-pointed trocar, such as is used for hydrocele. The canula is passed down to the membrane, and placed on one side of its centre, lest the long head of the malleus should be interfered with. The trocar is then pushed on gently, and should penetrate but a very short distance, for fear of injuring the important parts at the bottom of the cavity. By some a sharp-pointed probe is used, passed through a quill; or an instrument about the same size with the probe is made for the purpose, with a canula to fit. But these are by much too small; even the puncture with a trocar closes, notwithstanding the application of nitrate of silver. I have lately used a sort of punch, such as is employed for making holes in leather, of a pretty large size, and neatly made, with the edge very keen, and on a small stalk. This is introduced; and when obstructed, having reached the bottom of the canal, an attempt is made, with a rapid turn of the hand, to cut out a portion of the membrane. I have thus succeeded in improving immensely the hearing of one gentleman, enabling him to hear at four or five times the distance he could formerly. He had repeatedly submitted to punctures before I saw him; and, previously to the operation with the punch, I passed through the membrane a trocar, made large, and well-pointed for the purpose; but notwithstanding this, and the application of the nitrate of silver, I was unable to preserve the advantage gained longer than a very few days. In suitable cases, the operation is worthy of trial, being unattended with pain or any dangerous consequences. M. Fabricci has contrived a very ingenious little instrument for the purpose; by it the piece of membrane is fixed by a small screw, before being punched out.

Bronchocele is not rare in some districts of Great Britain, but unattended with the same peculiarities of countenance and mind as in some other countries.* The majority of those affected come from mountainous districts. The disease generally commences early in life, and females are more subject to it than males; indeed almost all who present themselves are females. The tumours are of various sizes, involving either the whole gland, or only a part. One lobe is usually in a state of greater advancement than the other. The swelling is for the most part soft and yielding, the integuments are thin and moveable, and large veins shine through them. It is unattended with pain, or any great inconvenience, though sometimes it equals in size the patient's head, or nearly so, and then it is troublesome from bulk alone. In general, there is little or no obstruction to deglutition or respiration, and the health is not impaired. The tumour is always of slow growth, at length becomes stationary, and the patient gets reconciled to the deformity. Its structure is that of the simplest form of tumour, a genuine hypertrophy, and it is seldom that its action degenerates. It is often made up also partly of cysts containing serosity, or glairy albuminous fluid.

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* [In this country goitre is most common in the mountainous districts of Pennsylvania, Virginia, New-York, Connecticut, New-Hampshire, and Vermont. It is very rare in the natives of the western and southern states. — Ed.]

Internal remedies have been prescribed, with the view of arresting the growth, and promoting absorption of the enlarged thyroid — burnt sponge — muriate of lime — muriate of baryta, &c. The use of iodine, externally and internally, has in many cases been attended with beneficial effects. Tumours have diminished, and even disappeared entirely, during the employment of this medicine; but in others, the diminution has been either trifling or none. The insertion of setons has been strongly recommended; and many patients are said to have been thus cured. I have tried this plan in one case only; it certainly had the effect of diminishing the swelling; but for some time great trouble was experienced from bleeding, whenever the cord was drawn, and the patient afterwards became much weakened by the profuse discharge. The proposal to tie the thyroid arteries, for the cure of bronchocele, has been put in practice, but without a favourable result.*

Extirpation of such growths has been repeatedly attempted; but the patients, almost without exception, have perished from hemorrhage, under the hands of the knivesmen. The immense supply of blood afforded to the gland in the healthy state must be kept in mind, as also the enlargement of the vessels proportional to the increase of the part. Not arteries alone, but enormous veins, are to be encountered. The tumour is in the vicinity of important organs, and of the trunks of large vessels and nerves, and probably has become attached to them. In short, the operation is attended with such risks, with so absolute a certainty almost of fatal result, as not to be warranted under any circumstances, far less for removal of deformity only.

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* [I have in two instances succeeded completely, and in another partially, in curing goitre of long standing, by the internal and external use of iodine; and am disposed to place more reliance upon this remedy in the treatment of this affection than upon any other with which I am acquainted. To be beneficial, it should be administered in large doses, and be continued for at least three or four months. The local remedy which has best succeeded in my hands consists of equal parts of iodine and of camphorated mercurial ointment, rubbed thoroughly upon the surface of the tumour twice a day. — Ed.]

Enlargement of the isthmus alone gives rise to more severe symptoms apparently, and may warrant an attempt at removal; but this can scarcely be accomplished altogether by incision. Such is my impression, and under this impression I proceeded very cautiously in a case of this nature with which I had to deal. — J. R., a rat-catcher, aged forty-seven, from the Highlands, was admitted into the Royal Infirmary. The isthmus of the thyroid gland was enlarged to the size of a goose's egg. The tumour was extremely hard and irregular on its surface, but not painful when touched; it appeared to be adherent to the trachea, and did not admit of much motion. The voice was considerably impaired, and breathing much impeded, inspiration being difficult and attended with a loud wheezing noise. On making unusual exertion, even though inconsiderable, the dyspnœa was much increased; and on ascending a height, or even remaining for some time in a stooping posture, it amounted almost to suffocation. There was no pain or uneasiness in the larynx or trachea. The disease was of three years' duration. A seton had been introduced, but effected no diminution, and rendered the tumour more dense and less moveable than formerly. I surrounded the lower part of the tumour by two semicircular incisions, and, dissecting cautiously beneath its base, detached it from its more loose connections, not interfering with the central portion and its connection to the trachea. During the progress of the dissection, the blood flowed most profusely from both arteries and veins, but was restrained by securing the former with a ligature, and compressing the latter with sponge. An armed needle was then passed through the centre of the tumour, as close to the trachea as possible, and its remaining attachment enclosed by the separate portions of the ligature firmly applied. Everything proceeded favourably. The tumour soon came away; the wound healed with a firm cicatrix, and in about a month the patient went home well. I met him by chance, in Aberdeen, twelve months afterwards, free of complaint, and breathing easily under all circumstances, his neck presenting no vestige of the tumour.

Glandular Tumours of the Neck, as formerly noticed, arise from various irritations; and some constitutions are more subject to them than others. The nature of the enlargement is dependent on the cause; it may be simple or malignant. Simple swellings often attain a large size; the lymphatic glands in both spaces of the neck, and on one or both sides, get immensely enlarged, the cellular tissue around is infiltrated with solid matter, and all matted together. Great deformity is produced; the head is turned with difficulty, and twisted to one side; often there is not much pain. After some time, the swelling becomes looser than before; its various portions separate, and gradually disappear; or the centre becomes soft, suppuration spreads extensively, and the surrounding hardness either goes off, or becomes partial.

Discussion of the swelling is to be promoted, and, if possible, the cause removed; and fomentation, friction, pressure, internal stimulants are to be employed, according to the state of the parts, along with what are called deobstruents, in the first instance. When suppuration cannot be arrested, the attention must be directed to prevent the integuments from being destroyed. With this view, the abscess should not be permitted to give way spontaneously, lest an opening be formed whose cicatrisation would cause deformity, and leave a stain on the race and generation. An artificial aperture must be made early; and in the upper and most exposed parts of the neck this should be in the direction of the folds, and small.

When many and extensive collections have formed, when the integuments have been undermined and attenuated before advice is sought, it is impossible to prevent deformity. The knife and potass are required, for reasons assigned in the preceding part of this work; and the detached glands, as well as the thinned skin, stand in need of their free application.

Deep-seated collections may originate in glandular disease, or commence in the cellular tissue; they occasionally follow transverse wounds of the neck. Great infiltration of the cellular tissue supervenes over the trachea and sternum, and also under the fasciæ; purulent matter is secreted in the cells, and the parts are extensively separated; sloughing is prevented only by free and early incision. The nature and extent of the coverings of an abscess seated deeply in the neck are to be kept in view — the platysma myoides, the superficial and deep cervical fasciæ. Collections under these interfere with the functions of the neighbouring parts, and are attended with great pain, which is somewhat relieved by resting the chin on the sternum, and so relaxing the fasciæ. The matter makes its way to the top of the sternum, and generally points on the outside of the sterno-mastoid muscles. But before the integuments become thin, the parts have been seriously injured — the cellular tissue has sloughed, the muscles have been separated from each other, with unhealthy purulent matter interposed — the trachea, the œsophagus, or the mediastinum, opened into. Such cases have been formerly alluded to.

The lymphatic glands, situated amongst the fat and cellular tissue between the deep and superficial cervical fasciæ immediately above the sternum, may become enlarged. When the tumour is large, breathing is impeded by compression of the parts beneath, and pain and much inconvenience are endured on account of its limited situation and resisting investments.

Purulent collections in the anterior mediastinum and under the sternum are scarcely remediable. These are chronic or acute. One of the great dangers following the operations on the larger vessels at the root of the neck, in which the deep fascia is necessarily divided, is infiltration into, and acute abscess of, the anterior mediastinum. In chronic collections the parietes of the cavity on one side are fixed, on the other have constant motion; and thus the surfaces, however healthy and well disposed, are prevented from coming together and adhering. The discharge continues, and at length wears out the patient, pulmonary affection perhaps supervening. The same unfavourable causes operate in other situations, in the iliac fossa, and in chronic collections under the cranium. In chronic abscess of the mediastinum, no dependent opening can be obtained, unless by perforation of the sternum. This is perhaps warranted by œdematous swelling over some part of the bone, indicating, along with other symptoms, the existence of matter beneath. Purulent collections sometimes form in the substance of the sternum, communicate with the mediastinum, and involve the lower part of the neck.

The thymus gland is said to be liable to chronic enlargement in young subjects of weak constitution, causing serious impediment to respiration and deglutition; the tumour is confined above and anteriorly, and consequently presses backwards on the trachea and gullet. Suppuration may take place in the swelling, and the matter ultimately be diffused in the mediastinum.

[HYDROCELE OF THE NECK.

An encysted tumour of the neck, to which the term HYDROCELE has been applied by some writers, is met with in both sexes and at various periods of life. Its progress is usually slow, and it generally arises without any assignable cause. Occasionally it has appeared to be congenital, but this must be considered as a rare exception. The tumour, seldom larger than a walnut, may acquire the volume of a Seville orange. When this is the case, it may impede respiration and deglutition, or even the return of the blood from the head. Its contents are of a serous or oily character, with an intermixture of flakes of lymph, and the cyst itself varies in thickness from the fourth of a line to a quarter of an inch or more. Externally it is more or less intimately connected to the cellular substance in which it is developed, while its internal surface often exhibits a rough, reticulated aspect, not unlike the false membrane of pericarditis. In cases of long standing the cyst is very firm and tough, or almost gristly, and closely adherent. The skin covering the tumour seldom undergoes any change, unless it is very large, when it is apt to become attenuated at some points and thickened at others. The subcutaneous veins may also then present a tortuous and distended appearance; but this is far from being generally the case.

The characters by which hydrocele of the neck may be distinguished from other affections are, absence of pain and tenderness on pressure, slight fluctuation, the slow progress of the tumour, years generally elapsing before it attains much development, and, above all, the history of the case. When the tumour projects outwardly over the carotid artery, it might be mistaken for aneurism, from which, however, it may, in general, be readily discriminated by the elevation of the entire swelling from the impulse of the blood, and by the want of that alternate expansion and retrocession which are present in genuine aneurism. When seated over the thyroid gland, or in its substance, it may be confounded with bronchocele. In all cases, where any doubt remains as to its true nature, an exploring needle or trocar should be introduced, which will at once determine the diagnosis.

The treatment of this affection, like that of the vaginal tunic of the testicle, may be palliative or radical. The former consists in evacuating the fluid, from time to time, with the knife or trocar; the latter, in injecting some stimulating fluid, such as wine and water, or a solution of iodine, or nitrate of silver; or, what is better, introducing a seton, and keeping it in the sac until it is obliterated by adhesive inflammation. Incision and extirpation have been practised successfully by Flaubert, Delpech, Jobert, and other surgeons.]

Distortion of the Neck arises from a variety of causes, and is either temporary or permanent. The head is often kept in an unnatural position for weeks by glandular swelling. Enlargement of the superficial glands, at the upper part of the neck, induces the patient to turn his head to the opposite side; swellings lower in the neck, and deep seated, require relaxation of the coverings, and the head is consequently twisted to the same side. Either rigidity, or spasmodic action, or both, of the sterno-mastoid muscles, displaces the head and twists the neck. The head is either bent forward, or turned to one side; usually, the chin is twisted over the shoulder, on the side opposite to the offending muscle. Induration of the muscle is sometimes met with, also causing distortion; it may terminate in abscess, or after a long time be discussed.

The cause of the spasmodic action in the muscle is sometimes apparent, sometimes very difficult to be detected. Sources of irritation at the extremities of neighbouring and communicating nerves are to be looked for and removed; and the spasms are to be moderated, as much as possible, by external and internal remedies. Opiate frictions, and the application of the nitrate of silver over the course of suspected nerves, are sometimes followed with benefit, and may be accompanied by the internal administration of antispasmodics, though the efficacy of these is often doubtful. When the head has been for a long period, perhaps many years, turned to one side, from any cause, the muscle on that side naturally becomes shortened, and a change takes place in the form of the bones. If the patient is still young, the deformity may, in a great measure, if not entirely, be remedied. Division of the shortened muscle was a favourite operation of old surgeons for the cure of wry-neck, and may be resorted to with advantage in some cases. One of the heads, or both, may require to be detached from the sternum and clavicle. It is only in cases where the muscle is in fault, it being shorter than usual, that benefit can be expected from this proceeding. It is a very simple operation, and can be effected by a mere puncture of the skin betwixt the two portions. By the cautious use of a blunt and flat probe or director, the cellular tissue under the origins of the muscle is separated; this is followed by a narrow and blunt-pointed knife, by which the attachments to the clavicle and sternum are cut across.

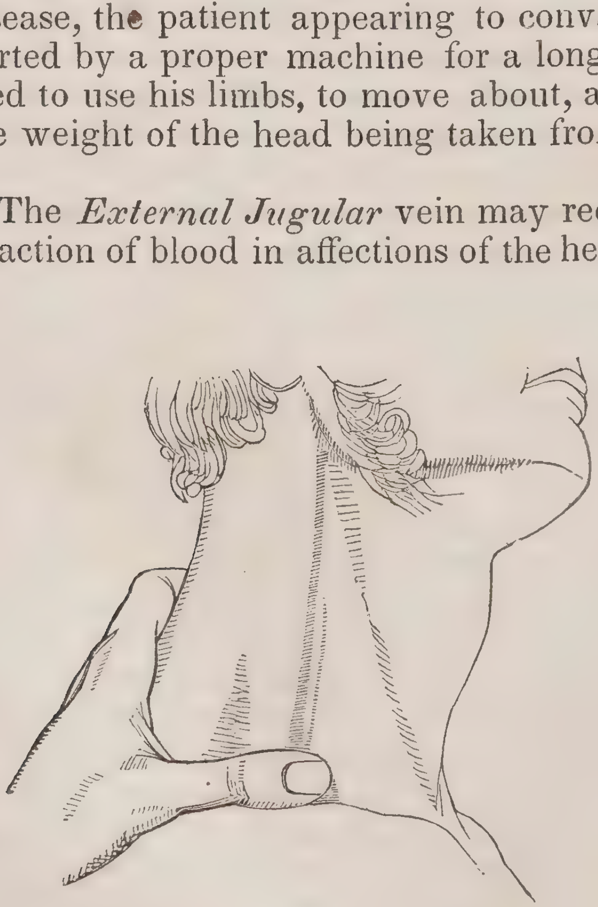
Distortion of the neck is most frequently produced by some vice in the bones, as curvature, from softening, attended with deformity of the trunk or of the limbs. In such cases, the twist is generally to the right side, the ear approaching the shoulder. No treatment can be effectual, unless the other curvatures are corrected; for the head is placed so to preserve the equilibrium of the body. The head is to be supported, and its weight removed from the vertebral column by a curved iron rod, attached to the back of stays fastened on the loins, leathern straps passing from the top of the rod under the chin and over the occiput. By the use of such apparatus for a considerable time, the vertebral column may regain its perpendicular direction, and all deformity of the neck be consequently removed. The application of such a machine is required after the division of the sterno-mastoid, so that the head may be kept straight until the muscle is reunited of a proper length, and any change in the form of the bones may be got over. In slight cases, this treatment is not required; on giving support to the trunk, and raising the shoulders to an equal level, the muscles of the back, perhaps stimulated by powerful and repeated friction, gradually bring the column into its proper form. Then the position of the head to one side is no longer required to balance the body. But a cure can be expected only, when no material change has taken place in the form of the individual bones.

Excurvation of the cervical vertebræ, — bending of the head forwards, and perhaps a little to one side, generally to the right, — takes place as a consequence of disorganisation of the ligaments and connecting fibro-cartilages of the vertebræ, with subsequent ulceration of the bones. The disease generally occurs in the superior vertebræ; in the articulation of the atlas with the occiput, or with the vertebræ dentata, or in the articulation of the latter with the one below. The articulations on the left side are usually affected first. There is stiffness, pain, and swelling of the soft parts covering the affected bones, attributed perhaps to exposure to cold, as when sitting in a draught, and supposed to be merely crick of the neck. The posterior cervical muscles are weakened, and the head is bent forwards. The patient is unable to support his head by the usual muscular action, and when in the erect position places his hands on the temples, to prevent it from dropping, and to keep it steady. Difficulty of swallowing is a prominent symptom from the first, as can readily be imagined when the close application of the constrictors of the pharynx to the forepart of the affected bones is kept in remembrance. The position of the head also renders deglutition awkward. The disease is attended with great suffering, evinced by marked anxiety of the countenance; and the pain is most violent during the night. The complaint is too frequently trifled with at the commencement, being not understood, nor its danger appreciated. The swelling increases, with pain, and the chin falls down on the sternum. The patient grows emaciated, and perhaps becomes weak in the lower limbs, and even in the upper; the feces and urine are imperfectly retained. Occasionally, abscess forms behind the upper part of the pharynx, increasing the pain and the difficulty of deglutition. On making an examination through the openings by which the abscess has emptied itself spontaneously, the bone is felt bare; and portions, even large, of the vertebræ, or vertebra, are, after some time, discharged, so as to expose the theca of the spinal cord. Even in such circumstances patients have lingered on, and that for so long a period as to allow of some unprincipled fool advertising a perfect recovery.

The termination of caries of the cervical vertebræ, often without any appearance of abscess, is in general fatal and sudden. The head, slipping from its support, falls forwards or to a side, causing immediate and complete paralysis of the whole body; dissolution soon follows. On examination, the articulating surfaces of the vertebræ are found displaced, and the shreds of ligaments which connected them ruptured. The atlas is separated from the occiput; or the processus dentatus, escaping from its situation, in consequence of destruction of its confining ligaments, is found compressing the medulla oblongata. This process is very often destroyed almost entirely, or it is so far detached by ulceration at its root as to be easily broken off. The disease in general seems to commence in the articulations, whereas in the vertebræ with larger bodies, abscess and ulceration have their foundation and origin more frequently in the deposit of tubercular matter in the cancellated texture of the bones. In other instances, the termination may be more slow and gradual; the patient is worn out by long suffering and continued purulent discharge; change of structure takes place in the theca vertebralis, or in the medulla itself; serous effusion occurs at the base of the brain; the patient's sensations are blunted, and he loses the use of his limbs gradually; his intellects fail, and coma supervenes, followed by death.

Active and early interference can alone arrest, subdue, or prevent the dreadful consequences of the disease above described; it is quite intractable in its later stages. Confinement to the recumbent posture, and strict rest of the affected parts must be enjoined; and blood is to be abstracted locally, once and again, according to circumstances; afterwards counter-irritation is to be employed, and repetition of moxas or of caustic issues is the most efficacious. When the painful feelings have subsided, and some impression has been made on the disease, the patient appearing to convalesce, the head must be supported by a proper machine for a long time. He will thus be enabled to use his limbs, to move about, and repair his general health, the weight of the head being taken from the weakened column.

The *External Jugular* vein may require to be opened for the abstraction of blood in affections of the head; or when venesection cannot be readily performed at the bend of the arm, from the small and indistinct condition of the veins in children, or in people loaded with fat. The vein is made to rise by pressure with the finger or thumb, as seen in the accompanying cut, above the clavicle. The lancet is passed though the integuments and platysma myoides into the vessel, midway between the jaw and clavicle. After a sufficient quantity of blood has been withdrawn, the pressure below is removed, and the edges



of the wound are put together with a bit of court plaster, or by means of a compress and bandage lightly applied.*

Ligature of the common Carotid may be required for the cure of aneurism at the angle of the jaw; or on account of hemorrhage from deep wounds in the same situation, when, from any circumstances, the divided extremities of the vessels cannot be secured. A deep incision of the angle of the jaw, towards the base of the cranium, not only divides important branches of the carotid, but may also wound the vertebral arteries where they project in a tortuous fashion, betwixt the dentata and atlas, or betwixt the latter bone and the occiput.

Ligature of the common carotid has been had recourse to, in order to stop bleeding from the mouth, nostrils, and other parts connected with the face, — for the cure of large or deep-seated aneurism by anastomosis, — and as a preliminary step to the removal of large and firmly attached morbid growths of the face or neck. This last proceeding, as already remarked, does not in any way enhance the patient's safety, whilst it adds much to his suffering.

The carotid has also been tied for the cure of aneurism at the root of the neck, when it was impossible to place a ligature betwixt the tumour and the heart. My opinion regarding this practice I have given formerly, when treating of aneurism in general.

For aneurism at the angle of the jaw, the point of deligation must in a great measure depend on the size of the tumour. The artery is most conveniently reached where it is crossed by the omo-hyoideus; and, when deligation at this point is both practicable and eligible, the vessel is exposed at the upper edge of the muscle. But circumstances may require the ligature to be placed much lower.

The patient is placed, either sitting or lying, with the head thrown back, and turned slightly to the side opposite the tumour. An incision is made in the upper triangular space of the neck, and in the course of the vessel, midway betwixt the sterno-mastoid muscle and the muscles covering the forepart of the larynx. Its extent depends on the thickness of the neck — on the muscular development and quantity of fatty matter, whether the neck be long or short. From two to three inches will in general afford sufficient space. The first sweep of the scalpel penetrates the skin, platysma-myoides, and cellular tissue. The cervical fascia is then divided carefully, with the hand unsupported. During the incision, the parts should be a little relaxed by attention to the position of the head. The sheath of the vessels is exposed by cautious division of the cellular tissue which occupies the space betwixt it and the cervical fascia. Thin copper spatulæ, bent to suit the purpose, are used to keep the edges of the wound apart. In general there is very little bleeding; but, that the operator may be sure of what he cuts, it is necessary frequently to clear the cavity with a bit of soft sponge. Each step of the operation should be slowly and surely accomplished; the least hurry is culpable. When the slight oozing has ceased, the common sheath, — which is distinctly seen, with the descendens noni lying on its forepart, — is to be opened to a slight extent with the point of the knife — the hand steady and unsupported, and no director used. The descendens noni is left to the inner side. The internal jugular vein, swelling up on account of the struggles and hurried respiration of the patient, has in some cases been found troublesome at this period of the operation, rendering the opening of the sheath and the use of the needle difficult. I have not met with any such obstacle in the cases in which I have been concerned. The aneurism needle should be slightly curved, with a perforation near the point; and the point should neither be bulbous, nor at all sharp, but all of the same thickness, and well blunted at the extremity and edges. It is introduced, carrying a firm round ligature of flax or silk, well waxed through the opening in the sheath, betwixt the par vagum and the artery, and from the outer side. The point is moved very slightly from side to side, and carried under the artery; no force being used, as it is unnecessary, and apt to be injurious. The instrument is thus gently insinuated, not thrust, through the cellular tissue, and made to appear on the opposite side of the vessel, with its point towards the trachea. It ought to be passed close to the arterial coats, and care must be taken to avoid including within its track part of the common sheath, or the descending branch of the ninth. Unless the surgeon be indeed very rash, there is little risk of the vein or par vagum being injured; to include them along with the artery would argue no small degree of most deplorable ignorance. The loop of the ligature is laid hold of either with the fingers, with forceps, or with a small blunt hook, and drawn towards the surface of the wound. It is then divided, and one-half retained, whilst the other is withdrawn along with the needle. The vessel must not be raised up from its situation, or detached from its cellular and vascular connexions, more than is merely sufficient for transmission of the needle. A single knot is cast upon the remaining half of the ligature, passed down, and tied firmly on the vessel, by the forefingers of the operator. This is secured by the finger of an assistant, whilst the ends are again passed through, so as to complete the reef-knot, and run down tight as before, the assistant slowly withdrawing his finger to make way for the ligature. A third knot may be made to insure security; but is seldom, if ever, necessary. As already observed, everything must be done with deliberation and caution, and the operation may be thus safely concluded in a very few minutes. One end of the ligature may be cut away close to the knot, or both brought out of the wound. The edges of the wound are put together, after all oozing has ceased, by one or two stitches, and the intermediate application of isinglass plaster; bandaging is unnecessary, and might be hurtful. The patient is placed in bed, with the head elevated considerably, so as to relax the neck. The wound will probably heal by the first intention, excepting in the immediate neighbourhood of the ligature; and the separation of this may be looked for from the tenth to the twentieth day. Then all risk of danger may be considered as past.

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* [To obtain a full stream of blood, the lancet should be carried *obliquely* upwards and outwards, by which means the fibres of the platysma-myoid will be cut across, instead of being divided vertically, and the edges of the incision will retract so as to form a much larger orifice. The pressure below the opening should not be removed until the wound has been closed, to avoid the introduction of air into the vein, an accident which may occur when this precaution is neglected. — Ed.]

Ligature of the Arteria Innominata has been practised in very few cases. It may possibly be required for aneurism of the subclavian, or of the root of the carotid; or for large axillary aneurism, greatly raising the shoulder, and involving the parts at the root of the neck.

The patient should be placed recumbent, with the head well thrown back. An incision from two inches and a half to three inches in extent is made in the course of the carotid, terminating over the sterno-clavicular articulation. If the incision is made more towards the inner border of the left mastoid muscle, greater space is gained. From that point, another is carried along the upper margin of the clavicle, to the extent of an inch and a half. The sternal attachment of the sterno-mastoid muscle is separated, the cervical fascia divided, the cellular tissue betwixt the sterno-hyoid muscles separated, and the vessel exposed. During the dissection, the internal jugular vein, the par vagum, and the recurrent branch, the inferior thyroid artery, and the arterial distributions from the thyroid axis, must be carefully avoided. The operator should, by free external incisions, make a dissection sufficiently spacious to admit of his seeing the bottom of the wound distinctly as he proceeds. It is necessary that he not only feel but see what he is about to cut; groping in this situation, and amongst such important parts, is unsafe, to say the least of it. Caution in passing the needle is here required equally as in ligature of the carotid. In such deep wounds the aneurism needles of Weiss, Bremner, Mott, or Gibson, may perhaps be found useful; but in general the common one is sufficient, and has always answered my purpose perfectly. During the dissection, it must be borne in mind that the pleura is not far from the edge of the knife. In one case of aneurism above the clavicle, and close to the outer border of the sterno-cleido mastoid muscle, and of the anterior scalenus, I exposed the arteria innominata by a cautious dissection; but, instead of surrounding that vessel, applied ligatures to the root of the subclavian and of the carotid. This latter was closed with the view of insuring the formation of a clot in the arteria anonyma. The patient suffered under abscess of the mediastinum, inflammation of the heart and pericardium, and ultimately he had repeated hemorrhage from the wound. The arteria innominata and the root of the two vessels were obstructed by firm coagulum. The blood had come from the distal end of the subclavian, and had been furnished by the regurgitation through the vertebral, thyroid, mammary, &c.

Ligature of the Subclavian Artery is required for the cure of axillary aneurism. That portion of the vessel within the scalenus and outside of the pneumogastric nerve is unfavourable for operation, in consequence of many branches being given off in an exceedingly short space. Besides, important veins and nerves are in the immediate vicinity. And though these were avoided, and the vessel reached and tied, still there would be no likelihood of a favourable result; obliteration of the vessel would not be expected to take place at the deligated point, one or more collateral branches arising close to the ligature. On the outside of the scalenus there is no such objection. But the vessel is deep, even in the healthy state, and much more so when aneurism has appeared in the axilla, and has attained but even a small size. But again, when the tumour is large, the shoulder is much elevated, and firmly fixed in its exalted level, so as greatly to increase the depth of the vessel.

The shoulder is to be depressed as much as possible, and the head thrown to the opposite side. An incision is made along the upper margin of the clavicle, and a second perpendicular to the first. These must be proportionate to the size of the patient, and the supposed depth of the vessel. It is better to err in making the external incisions too large than too small; neither the pain nor the duration of the cure is much increased thereby. But, by an opposite course, both the difficulties and the dangers of the operation are rendered far greater. The external jugular vein must be avoided if possible by the knife; it should be detached slightly, and pulled inwards. The supra-scapular artery, running in a line with the clavicle, ought also to be saved; it acts a principal part in performing the anastomosing circulation after ligature of the trunk; and, although the arm would receive a sufficiency of blood from other branches, it is well to keep this entire — not to mention the trouble which wound of it would occasion the operator, by constantly filling his incisions with blood, and the delay caused by the application of ligatures to the bleeding extremities. Its division can easily be guarded against, and should be avoided. The subclavian vein is not in the way; it is lower down under the clavicle than where the surgeon requires to introduce his instruments. The fascia and cellular tissue are divided carefully, until the cervical plexus of nerves appears, and then the artery is to be looked for on the same level with the plexus, and towards its sternal margin. But, in cutting for this or any other vessel, it must be recollected that pulsation is a very uncertain guide. It is communicated to the neighbouring parts, and often is scarcely to be felt at all, or is at least very indistinct. In any situation pulsation is very perceptible before division of the integuments, and other superimposed parts; but after resistance has been removed by exposure of the vessel, it ceases almost entirely. The sense of touch is the principal guide, and, to experienced fingers, the feel of nerves is different from those of arteries. The ligature has been passed round one of the cervical plexus, as happened in one of my own cases; the mistake was, however, not without its use, for, on discovering that it was a nerve, I retained the ligature, no knot having been cast, and by it pulled the nerve out of the way, so as to allow of the artery being more readily secured. The artery is felt as it crosses over the first rib, and by pressure there, pulsation in the arm is stopt; sometimes it may be even seen. The knife, guided by the finger, is then used very cautiously to prepare the vessel for ligature. The vessel may be found unsound, and dilated to a further extent than had been expected; and then it may be necessary to trace it towards the heart, and even to divide the scalenus anticus in part, the phrenic nerve being kept free from injury, in order to expose a sound portion for the application of the ligature. This was found necessary in one of my own cases, and also in one operated on by the Baron Dupuytren. A blunt-pointed needle is passed, either plain or with a separable point, and the knots made as was formerly described. A piece of strong wire doubled, and either notched or perforated at the extremities, affords assistance in securing the knots in so deep and contracted a space. Various kinds of serre-nœuds and needles have been recommended; but the simpler the instruments employed are, and the less a surgeon depends on them, the more likely is he to succeed in his undertaking.*

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* [I am induced to subjoin the following example of axillary aneurism for which the subclavian artery was tied, in the belief that, from the *unique* manner of its termination, it will be interesting and instructive to the reader. The particulars of it, together with an analysis of twenty-six other cases reported by different surgeons, will be found in the *Western Journal of Medicine and Surgery* for June, 1841.

Daniel Monday, a married negro, thirty-six years of age, of a stout muscular frame, and a brickmaker by occupation, consulted me, in February, 1841, for a circumscribed, pulsating tumour, produced by the recoil of the butt-end of a yager, and situated beneath the right pectoral muscle, extending from the clavicle down towards the cartilage of the fourth rib. It was of an irregular, conical shape, and about the volume of a large fist, measuring fully four inches at its base in one direction, by three and a half in the other. In its feel it was tense, as well as inelastic; the blood rushed into it with a whizzing noise, and the pulsation was so distinct that it could be seen at the distance of some feet from the patient. The clavicle was thrown above its natural level; the whole limb, from the top of the shoulder to the ends of the fingers, was benumbed, painful, and almost deprived of power; the pectoral muscle was much stretched; and the patient constantly inclined his head towards the affected side, keeping the elbow nearly at a right angle, and supporting it carefully with the opposite hand, to prevent tension of the tumour. The swelling of the limb, however, was slight; the temperature was also good, and the pulse at the wrist was nearly as distinct as in the natural state. For the last four weeks the pain was almost incessant; it was particularly severe at the chest and shoulder, and had become so agonizing of late as to deprive him of sleep, and even prevent him from lying down. The appetite was also much impaired, and the countenance expressive of the deepest distress. The tumour had grown with great rapidity during the last two months; and, as there was danger of its bursting, an operation was at once decided upon.

The patient was placed upon a narrow table of moderate height, the head and chest being elevated with pillows, and the face turned

During the time that this sheet was passing through the press, a case of aneurism above the right clavicle came under treatment in the hospital, on which it was proposed to perform the operation of

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slightly towards the opposite side, while an assistant pulled at the wrist, to depress the affected shoulder. The integuments over the clavicle being stretched upon the chest, I made my first incision along the centre of that bone, beginning near the sternal origin of the mastoid muscle, and passing out towards the acromion process of the scapula for about three inches and a half; thus dividing at one stroke the skin, cellular substance, and fibres of the platysma-hyoid. The parts being allowed to retract, left the lower margin of the cut parallel, and on a level with the superior border of the clavicle. A second incision, about two inches in length, was carried along the posterior edge of the sterno-mastoid muscle, at a right angle with the preceding. The triangular flap thus formed was then dissected up and held away, care being taken not to interfere with the external jugular vein, or any of the smaller arteries of the neck. Having advanced thus far, the cervical aponeurosis was detached from the clavicle by cautious strokes of the handle of the scalpel, which laid bare the brachial plexus of nerves and the omo-hyoid muscle. At this stage of the operation a small vein, a branch of the subclavian, was divided, and, although it bled very little, it was immediately secured by a temporary ligature. Taking the omo-hyoid for my guide, I divided the loose cellular substance in the triangular space bounded above by the muscle just mentioned, by the clavicle below, and by the anterior scaleni muscle internally, and thus approached the artery as it passed over the first rib. The vessel here lay at some distance from the inferior branch of the brachial plexus of nerves, rather deeply behind the collar-bone; and with a common aneurism needle, armed with a double ligature of saddler's silk, no difficulty was experienced in securing it, the instrument being carried from before backwards and from below upwards. The ligature was then drawn very firmly with the fingers, and tied with a double knot within a few lines of the anterior scaleni muscle: as soon as this was accomplished, all pulsation in the sac, as well as at the wrist, ceased. One end of the ligature being cut off, the other was left protruding at the inner angle of the wound, the edges of which were closed by three sutures and adhesive strips. Not half an ounce of blood was lost during the operation, which lasted twenty minutes.

The patient being put to bed, the limb was laid in an easy position, and wrapped in cotton wadding. In less than an hour the temperature, which had been considerably depressed, was thoroughly restored; the pain and numbness had greatly abated; and the poor fellow expressed himself more comfortable than he had been for a month. In less than twenty hours the tumour was quite solid; the ligature came away on the morning of the thirteenth day; and the patient was in all respects convalescent, the swelling having diminished fully one-half in size. No untoward symptoms of any kind occurred until the morning of the twenty-seventh day, when the tying the trunks of the subclavian and carotid as they pass off from the innominata. The necessary incisions were made, but the innominata was found wanting. After some troublesome dissection, the

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patient was suddenly seized with intense pain in the right side of the chest, attended with short, hurried, and laborious respiration, quick and tense pulse, great anxiety of countenance, prostration of the vital powers, and *entire subsidence of the aneurismal tumour.* Being absent from town, he was kindly visited by my friends, Dr. T. L. Caldwell and Dr. S. B. Richardson, until he expired, early on the thirty-first day after the operation.

The body, carefully examined after death, was somewhat emaciated; the wound had completely cicatrised, and the pectoral muscles were a good deal wasted, though in other respects unchanged. The subclavian artery terminated abruptly at the outer margin of the scaleni muscle, where the ligature had been applied, its calibre being closed by a mass of solid fibrin, about one-third of an inch in length, which adhered firmly to the lining membrane, and thus presented an effectual barrier to the passage of the blood. Between this and the thyroid axis the vessel was occupied by a dark coagulum, which, as it was loose, was probably formed only a short time before death. Beyond the seat of the ligature the artery had a rough, ragged appearance, and was sufficiently pervious to admit of the ready passage of a small probe into the aneurismal sac. Superiorly the tumour was overlapped by the brachial plexus, while in front, at its lower part, was the subclavian vein, which, besides being thrown out of its natural course, was considerably diminished in size. No pus was anywhere perceptible, the structures involved in the operation being consolidated by plastic lymph. The aneurismal tumour, placed immediately below the clavicle, was of a conical form, and about the volume of a moderate-sized orange, being two inches and a quarter in diameter at its base. Its walls varied in thickness at different points, from half a line to the eighth of an inch; and its interior communicated, by means of an oval aperture, one inch and three-quarters in length by an inch and a half in width, with the pleuritic cavity: it was situated between the first and second ribs, nearly equi-distant between the sternum and the spine, and was the result obviously of ulcerative absorption induced by the pressure of the tumour. Both ribs were denuded of their periosteum immediately around the opening, and the serous membrane had a shreddy, ragged aspect. The aneurismal sac contained a few reddish clots arranged in a laminated manner, and closely adherent to its inner surface, especially at the part corresponding with the apex of the tumour.

The right thoracic cavity contained nearly three quarts of bloody-looking serum, intermixed with flakes of lymph and laminated clots; the latter of which were of a reddish-brown colour, and had evidently escaped from the aneurismal sac. The pleura exhibited signs of extensive inflammation; and the right lung was greatly reduced in volume, from the compression of the effused fluid. The left lung was considerably engorged, and at one or two points almost hepasubclavian artery, which appeared to have come off irregularly, was discovered crossing from the left to the right side, to take its place betwixt the scaleni, rather more than half an inch behind the carotid, and close upon the forepart of the vertebræ. The ligature was placed on the mesial side of the pneumogastric nerve, and close to it. Up to this, the twenty-second day, the case is going on most favourably.

The axillary portion of the brachial artery cannot require to be tied for true aneurism. Were the aneurism seated at the border of the axilla, and the upper portion of the vessel beneath the clavicle free, the best, wisest, and safest proceeding is to tie the subclavian. Then, the shoulder not being raised, the vessel is not so deep as when the aneurism involves the whole axilla. The incisions are not so deep nor so extensive, and do not implicate so important neighbouring parts as those for ligature of the axillary artery; and besides, the vessel is tied farther from the diseased part.

The axillary artery may be tied on account of wounds, either immediately upon the infliction of the injury, or some time afterwards. The dissection is difficult, the vein being much in the way, and the vessels surrounded by nerves, and intimately connected with them by dense cellular tissue. The artery is more involved at the middle portion of the axilla than at the superior and inferior; at that point, too, the cephalic vein, as well as the axillary, impedes the operator.

To reach the upper portion of the artery, much muscular substance must be divided. An extensive incision, in the course of the vessel, is made through the integuments. The pectoralis major is got through by separation and division of the fibres, the incision in it being made with as little cross-cutting as possible. Part of the pectoralis minor, probably the superior half of the muscle, must also be cut. The parts are then exposed, the vein to the inner side of the artery, and the nerves interlaced. The vessel is carefully isolated at one point, and there secured.

It is almost impracticable to reach the middle portion of the axillary — supposing the vessel to be divided into three equal portions — without injurious interference with the nerves. If operating with the view of tying the extremities of the vessels wounded at this point, the probability is that the nerves have been divided along with the artery, and then the proceedings are more simple. The incisions are made

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tized. The heart and pericardium were sound, as were also the abdominal viscera, and the larger arterial trunks.

From the description of this operation in the text, it will be seen that Mr. Liston recommends two incisions, as performed in the above case. Were I to be again called upon to tie the subclavian artery above the clavicle, I should certainly omit the vertical incision, from a conviction that it is altogether unnecessary: it does not expedite the operation, nor does it facilitate the application of the ligature. — Ed.]

in the direction of the bleeding point; this is reached, and each extremity of the vessel securely tied.

The lower third of the artery is less involved with the vein and nerves, and can be reached without division of muscular fibres. The arm is abducted and elevated as much as possible. The axilla is thus exposed. A free incision is made in the course of the vessel, which, by cautious dissection, is brought into view; it can then be dealt with as may be required.

Spontaneous aneurism is of rare occurrence, lower in the brachial artery than its axillary portion. However, it is sometimes met with at the bend of the arm. But the aneurismal tumour in this situation is more frequently the consequence of wound of the vessel, inflicted whilst opening a superimposed vein. The mode of proceeding in venesection, the precautions to be employed, and the evils that sometimes follow this little operation, will be treated of by and by. Wounding of the artery is not so common an accident now as formerly. Venesection is not so universally and unnecessarily resorted to as formerly, and is performed by better instructed practitioners.

Puncture of the brachial artery, at the bend of the arm, is not uniformly followed by extravasation of blood, or by the formation of aneurism. That it is wounded is known by the impetuous and saltatory flow of florid blood, accompanied with a wheezing noise. In such circumstances, the thumb is placed firmly over the wound; the fingers separately, the hand and the forearm of the patient are all supported by uniform bandaging; and a graduated compress, supplying the place of the thumb, is firmly applied, and must be retained for many days. Thus extravasation is effectually prevented. But the measures must be adopted instantly, before the edges of the opening are rounded, and any quantity of blood has escaped into the cellular tissue; the apparatus must be well applied and retained. When pressure is required on any point, it is absolutely necessary to give support to the lower part of the limb, as was formerly insisted on; and the proceeding is, if possible, more necessary in this case, the requisite pressure being very great. If ordinary compression only, sufficient to prevent the flow of blood through the opening in the integuments, is applied, blood is extravasated into the cellular tissue, breaking it up, and causing condensation beyond; fluid blood accumulates in the space thus formed; the surrounding cellular tissue is more and more condensed, at length constituting a firm sac, confining the fluid, and communicating with the opening in the artery; in fact, a pulsating and gradually increasing aneurism is established.

Or a sac is formed, into which blood is propelled from the artery, and which also communicates with the opening in the vein. This state of parts is denominated varicose aneurism; it is very rare.

Or, again, no extravasation takes place, and the artery and vein unite by lymph effused around the openings, the wounds remaining unclosed, and forming a permanent communication between the vessels. Thus, a portion of the arterial contents is constantly being injected into the vein, producing a thrilling sensation, but little or no tumour. The passage of the blood through the narrow aperture is also accompanied by a peculiar noise, closely resembling that caused by the motion of the fly-wheel in a musical box. This disease is termed aneurismal varix, and is not so rare as the preceding. For this treatment is seldom requisite.

In recent cases of false aneurism, the sac may be cut into, the vessel exposed, and tied above and below the opening. This is recommended from its being found that the tumour is sometimes slow of disappearing after ligature of the vessel at a distance above. But when the tumour is of considerable duration and size, containing coagula, and the surrounding parts are separated and altered in structure, there is no doubt as to the propriety of tying the humeral near its middle — as also, in the case of spontaneous aneurism. The vessel is not deep, but much entangled with nerves and veins. A free incision is made over its course, dividing the skin, cellular tissue, and fascia ; the sheath is opened, and a ligature passed round the exposed artery. But it must be recollected that high division of the humeral is not uncommon, and, before casting the knots, pressure should be made on the vessel with the finger against the loop of the ligature, and the effects on the tumour watched ; if pulsation cease, and the tumour become flaccid, the ligature should be secured; but, if no effect is produced on the swelling, high division is demonstrated, and the other branch must be looked for. Pulsation is certain to return in the tumour, after a few days, and if slow in again disappearing, gentle pressure should be employed — the arm, hand, and fingers being previously bandaged, to prevent infiltration of the limb.*

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* [I had occasion last winter to tie the humeral artery, for a wound inflicted upon it in bleeding at the bend of the arm, in a youth eighteen years of age, from one of the border counties of this state. The accident had occurred about six weeks previously with a thumb-lancet. It was soon followed by great swelling and discoloration of the limb, which gradually extended downwards nearly to the middle of the forearm and upwards as far as the axilla. The pain was excessive, the appetite much impaired, the sleep constantly interrupted, and the countenance blanched and expressive of great suffering. About the fourth week a large opening formed at the seat of the original orifice, from which upwards of a quart of thick grumous blood was discharged. He was brought to town on the 27th of December, and placed under the care of my friend, Dr. Drane. At this time his health was frightfully deranged ; his strength was much exhausted ; he had not slept for several nights ; and the whole limb, benumbed and excessively painful, was swollen from the wrist to the shoulder. The parts pitted under pressure, two small foul-looking ulcers existed at the bend of the arm, the skin was discoloured, and fluctuation could be distinctly felt all the way up from below the elbow to the insertion of the deltoid muscle.

With the assistance of Dr. Drane, an incision, five inches in length, was made over the course of the humeral artery ; and after much difficulty, owing to the confused state of the parts, a ligature was

Wounds of the radial and ulnar arteries may require their being exposed and tied at various points and at various periods — shortly after the accident, or after the lapse of many weeks — on the occurrence of secondary bleedings, or after the formation of false aneurism. This is accomplished by incision in the course of the wounded vessel, sacrificing as few muscular fibres as possible. Nevertheless, the incision must always be free, to enable the surgeon to effect his purpose readily.

Wounds of the Palmar Arches, and of the branches proceeding from them to the extremities of the metacarpal bones, are exceedingly common; as also wounds of the radial artery betwixt the thumb and forefinger, of the arteria radialis indicis, and of the superficial volar branch. The opening in the integuments and palmar aponeurosis is usually narrow, and the hemorrhage copious; it is generally arrested by pressure, not always well or efficiently applied. From these circumstances, blood is extravasated extensively into the deep cellular tissue, blood continuing to escape from the artery, and being either imperfectly discharged, or completely confined. Great swelling, with tension and acute tenderness, takes place; in fact, rapid inflammatory action is kindled in the infiltrated parts, and unhealthy abscesses form; the matter ultimately reaches the surface, but by that time ulceration or partial sloughing has taken place at the wounded part of the vessel; profuse and repeated hemorrhages take place, and are with difficulty controlled. The patient becomes weak and pale. The greater part of the forearm may become involved in the inflammation, terminating in infiltration of the cellular tissue, and the formation of diffuse abscesses.

In the first instance, instead of trusting to pressure, — which almost uniformly disappoints expectation, does not prevent internal bleeding, and leads to a severe form of inflammatory action, — it is better at once to enlarge the wound, and tie the wounded vessel above and below the injured point. Thus all bleeding is effectually prevented, and the risk of unfavourable consequences done away with. But after inflammatory swelling has commenced, such a proceeding is difficult, often almost impossible, and generally fruitless. The parts are then full of blood, lymph, serosity, and pus, separated from each other, and changed both in appearance and structure; the vessel is either not visible on account of the infiltration around, or its coats are so diseased as to be incapable of holding a ligature. At any period, it is unsafe and unwarrantable to dive, pretty much

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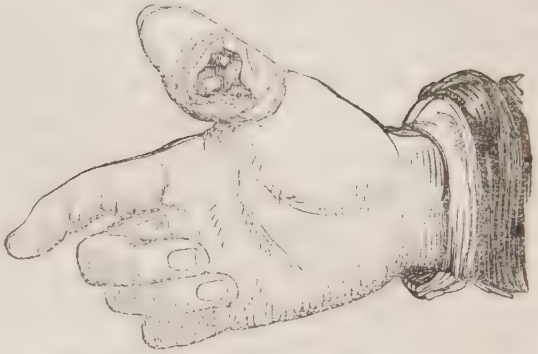
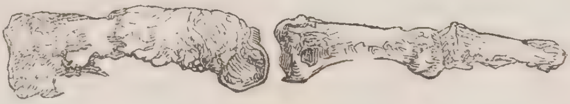
placed above and below the orifice, which was found to be at least six lines long! All the grumous blood, amounting to nearly a quart, was squeezed out, when the edges of the wound were brought together with adhesive strips and a roller extending from the wrist upwards. Very little sloughing took place; and, notwithstanding the exhausted condition of the patient at the time of the operation, he made a very speedy recovery. — Ed.]

at random, with a sharp needle, amongst tendons, nerves, arteries, and veins, with the hope of so including the wounded branch. In some cases of secondary bleeding — if no great inflammatory action has taken place, and no abscesses have formed — the wound may be dilated freely, and compression made on the bleeding point by dossils of lint filling the wound completely, and supported by a bandage. This dressing, retained for some days, often succeeds perfectly; permanent obstruction of the vessel, and consolidation of the parts immediately around, having been accomplished by the effusion and organisation of lymph. When this method fails — and when the case is more advanced, with pain, and swelling, and abscess — weakening of the circulation in the part is found to be effectual. The main artery is to be obstructed at a distance from the wounded part. It is needless to tie the radial, or the ulnar, or both; for still blood will be poured in by the interosseous and its anastomoses. The humeral must be secured in the middle of the arm, as has been practised in many instances, and with uniform success. Thus the bleeding is arrested until the wounded vessel recovers, and becomes permanently closed by salutary effusion; then the inflammatory action, and its consequences, in the surrounding parts, must be treated on the general principles of surgery.

Paronychia, or Whitlow, designates inflammatory action and its consequences, in the structures composing the fingers. The mere surface may be the seat of the inflammation of the cellular tissue, or the fibrous structure betwixt that and the sheath of the tendons; or the firm and true sheath of the tendons, and the synovial surface; or the investing membrane of the bone, the bone itself, and the articulating surfaces and apparatus may be involved secondarily, or from the first. The inflammatory action may commence in any of these structures, but, if uncontrolled, ultimately attacks the greater number, or all of them. The deeper seated the action, the more violent are the symptoms, and the greater the danger to the member. In the cutis vera of the fingers, there is a plentiful distribution of nerves of sensation; and, consequently, in superficial whitlow, the pain is often severe, with throbbing, and an occasional feeling of itching. The part is swelled and red, and the redness is diffused. After a short continuance, the swelling increases at some points, often about the root of the nail, from effused fluid betwixt the cuticle and rete mucosum; the fluid is sometimes serous, generally sero-purulent. In the deeper-seated inflammation, the pain, throbbing, heat, and swelling, are all greater. The pain is more intense, and almost intolerable, allowing the patient little or no rest; and the throbbing extends to the vessels of the hand and forearm. A considerable degree of fever attends. The action either involves one phalanx, or extends over the whole finger, and ultimately attacks the hand. The palm is hard, pained, and swelled; and, in advanced cases, swelling takes place above the annular ligament. Often the surface of the back of the hand is also inflamed, and the cellular tissue loaded with serum. The disease, if not actively and properly treated, terminates in a very





short time; in two or three days suppuration takes place, with sloughing of the cellular tissue, of the sheaths of the tendons, and of the tendons themselves. Either ulceration or necrosis — often both in combination — occurs in the phalanges; or the apparatus of one or more of the articulations is destroyed. Abscesses also form in the palm, on the back of the hand and finger, and sometimes under the fascia of the forearm. The separation of portions of one of the tendons is not always followed by loss of motion in the finger; neither is exfoliation of the greater part of the distal phalanx always attended with much deformity or shortening, a nucleus being often left from which bone may be reproduced. But destruction of the whole flexor or extensor tendons of one of the middle or proximal phalanges, or destruction of one of the articulations connecting them, is not only attended with great suffering, but followed by total uselessness of the part. The wounds may, after a tedious process, heal up; but the finger remains deformed and immovable, in a contracted or extended position, as may be.

The disease may be occasioned by bruises or punctures, the instrument with which the puncture is inflicted being impregnated, or not, with some putrid animal matter. Violent inflammatory action almost uniformly follows opening of the articulations, and also lacerated wounds over the joints. Compound fractures and dislocations of the phalanges are certainly followed by a severe form of inflammation. But the disease is met with in all degrees of intensity, occurring without any assignable cause. It prevails in spring and autumn; and is common in hard-working people, in butchers, cooks, &c.

In superficial whitlow, the bowels must be attended to, and blood may be abstracted locally, either by punctures or by the application of leeches along the side of the finger, hot fomentation being assiduously and regularly employed afterwards. Or the nitrate of silver may be rubbed lightly over the discoloured parts; frequently the inflammation may be arrested, and resolution speedily effected, by this simple application, laxative or purgative medicines being at the same time administered, as required. The collections which form are evacuated by simple division of the cuticle, and this, when hard, should be clipped away; poultices are used for a short time, and then the raw surface is dressed simply, and the finger bandaged daily. The hand should be kept constantly elevated. The swelling is soon reduced, the cuticle is regenerated, and free motion of the finger returns gradually.

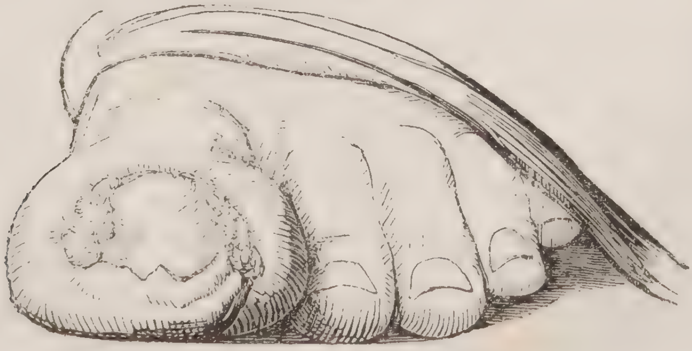
In more severe cases, fomentation and copious abstraction of blood by leeching, at a very early stage, may effectually suppress the inflammatory action; but patients seldom apply till after the opportunity for this treatment has passed. When tension has occurred, whether purulent matter has formed or not, a deep and free longitudinal incision must be made, including the affected tissues. This is uniformly followed by great relief, all the violent symptoms subside, and the action is limited; the effusion, if any, escapes, and the affected bloodvessels are emptied — further suppuration is prevented, and the tissues are perhaps saved from destruction. Fomentation and poultice are used till the swelling begins to disappear, and the discharge to diminish; and the hardened cuticle is removed, when detached. The cure is completed by bandaging, and such applications to the wound as its appearance may render suitable. Should inflammation recommence and extend, or abscess threaten in other parts, recourse must again be had to free incision, followed by the treatment already described.

Destruction of the articulating apparatus, with ulceration of the opposed surfaces of the bones, is indicated by indolent swelling around, by unhealthy and profuse discharge, by distinct grating being produced on motion, and by marked and unnatural looseness of the joint. In such circumstances, amputation of the finger above the diseased part is fully warranted. But if the patient is obstinate in refusing to submit, or if he is in that rank of life where stiffness of the finger is of no great consequence, the member should be kept steady in a convenient position, so as to favour anchylosis. By splints and bandaging it is preserved in a state of semiflexion, so that, after the cure by anchylosis, it may not be in the way when the patient lays hold of anything, as it would be were it bent into the palm, nor exposed when the other fingers are bent, as must be the case were it kept quite straight. Still the finger is often very useless — worse than useless — when stiff either from loss of the tendons or from destruction of the joint; and more particularly when its position is awkward. So much inconvenience does it give rise to, that patients, who peremptorily refused amputation whilst the case was recent, often return, after a tedious and painful cure by anchylosis, soliciting removal of the deformed and annoying member. When the thumb, however, is the seat of disease, it is of great moment to save any part of it. A stiff joint in the thumb is of less consequence than in a finger; it can still be brought to oppose the rest of the hand in seizing and retaining hold of objects. To promote anchylosis, the affected articulation must be kept at perfect rest, and for a very considerable time. By pursuing this practice, the thumb, represented at page 397, though in a very bad state, the joint being thoroughly disorganised, was preserved. In severe cases of whitlow, all the fingers, the whole hand, and even the wrist, long remain rigid; but the rigidity is gradually dissipated by friction, and by motion, at first gentle and passive.

Chronic thickening and contraction of the *palmar aponeurosis* occurs occasionally, and, in some cases, to such an extent as to disable the hand almost entirely. The fingers are permanently bent, the palm is hard, and the integument puckered. The most severe examples which I have witnessed occurred in those who were in the frequent habit of playing keyed or stringed instruments; in others no cause could be assigned. Frictions with all kinds of oils and compound liniments, plasters, ointments, &c., have been tried as remedies for this affection, but in vain. The tendinous slips passing to the contracted fingers have been divided, and the origin of the palmar fascia has been cut across, but without permanent benefit. Indeed I believe the disease to be incurable.

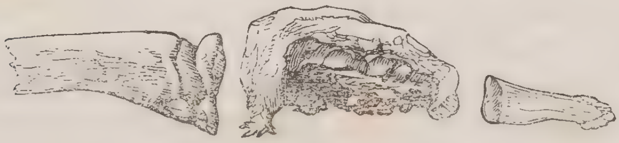
The term *Onychia* is sometimes, and not without good reason, designated *maligna:* it is applied to ulceration about the nail. Some of such sores are small, and not indisposed to heal; others are very obstinate. They occur at all periods of life, frequently during infancy. They usually commence in a small and irritable tumour or granulation by the side of the nail, or at its root, with swelling and redness around. This may follow bruises or laceration and removal of the nail, extravasation under it, and various injuries of the part. The disease is also met with in the toes, most frequently the great one, causing much lameness; then it is generally owing to the pressure of tight shoes. In many cases the ulceration is extensive, shreds of the nail projecting through the angry surface; there is considerable loss of substance; the discharge is thin, bloody, acrid, and abominably fetid; the edges of the sore are jagged, and the integuments around are of either a bright or a dark red, according to the state of the disease. Sometimes the bone is exposed, and involved in ulceration; or, instead of having lost substance, it is found of an unusually spongy and open texture, and with recent osseous matter superadded. A violent burning pain attends the disease when advanced; the absorbents are irritated and inflamed, and the glands enlarge along their course. The general health is often impaired in consequence; frequently the disease occurs in those of broken-up constitution, along with sores and eruptions on other parts of the surface, ulcerations of the mucous membranes, and other indications of cachexia.

By judicious exhibition of purgatives, antibilious medicines, and preparations of sarsaparilla, and by regulation of diet, the general health may be improved. The edge of the nail, when in contact with the ulcerated surface, must be removed — more especially when the great toe is affected; not that any undue growth is the cause of



the disease, but because the sore, pressing on the sharp edge, produces much pain, and keeps up the morbid action. About one-third in breadth of the nail should be taken away; one blade of strong and sharp-pointed scissors is passed along beneath the nail as far as its root, and by rapid approximation of the other blade the part is divided; the isolated portion is then laid hold of by dissecting forceps, or small flat-mouthed pliers, and pulled away by the root. This should be performed as quickly as possible, for the operation, though trifling, is attended with most acute pain; it is quite effectual, the relief is great, and almost immediate. The nail may also be removed by scraping and paring; but this method is not so effectual as the preceding, and almost equally painful. Afterwards the best application to the ulcerated surface, as to other irritable sores, is the nitrate of silver, either used solid and followed by poultice, or employed in the form of lotion. The remedy is almost specific; very few cases prove obstinate under it. Sometimes it may be of advantage to alternate it with the black wash. In protracted and unyielding cases, removal of the whole matrix of the nail has been proposed; the dissection is painful and tedious, and its efficacy doubtful. When the sore is of a weak character, discharging a glairy secretion, studded with soft flabby granulations, connected with unsoundness of the neighbouring cellular tissue, surrounded by undermined integument, and by considerable boggy, soft swelling, free application of the caustic potass is highly beneficial. When the bone is denuded, and involved in ulceration, the phalanx should be amputated.

Unhealthy children are subject to disease of the phalanges, and of the metatarsal and metacarpal bones, excited by slight injury, or originating without apparent cause. Often more than one bone is affected. There is great swelling of the soft parts around the diseased bone, indolent, and not painful; at first hard and white, afterwards more yielding, and of a dark-red hue at one or more points. Imperfect suppuration takes place, the integuments ulcerate, and the cavity of the abscess leads to the exposed bone; a portion of this generally dies, and is a long time in separating. Great addition of bony matter is deposited around, in irregularly aggregated nodules; and a large shell is so formed, partially investing the sequestrum. This affection may be termed *scrofulous necrosis*.



Or the bone does not die, but is exposed and ulcerated superficially; or a considerable cavity forms in its interior, apparently from tubercular deposits and suppurative degeneration of the cancellated structure. The secretion from the ulcerated surface is thin, acrid, and often bloody; and new osseous matter is studded around. The surface of the rest of the bone is unusually open in texture, whilst its interior is condensed, and the cancelli are filled with lardy substance. This form may be called *scrofulous caries*.

Abscesses in the soft parts form one after another, several of the bones are often affected at the same time, superficial abscesses and affections of the joints and bones often take place in other parts, and the patient grows weaker and weaker.

Whilst the surgeon attends to the general health, and employs palliative local applications, nature frequently effects a cure. The sequestrum ultimately separates, or the ulceration gives way to more healthy action. New bone fills up the cavity, the redundant osseous deposit gradually diminishes, the openings in the integuments close, and the swelling subsides. In some rare cases, it may be necessary to take away the offending part, in consequence of the health alarmingly declining.

Collections in the Thecæ of the flexor tendons are occasionally met with. Those of the thumb and forefinger are most frequently affected. The swelling often attains considerable size. The fluid is colourless and glairy, mixed with small cartilaginous bodies of a flattened form, and the size of mustard seeds, or split peas. The swelling sometimes extends under the annular ligament, and under the fascia of the forearm. Alternate pressure on the different parts of the swelling is attended by a very peculiar sensation. Motion of the parts is seriously retarded.

Accumulation of the fluid is not prevented by any means. Puncture has been practised successfully in several instances, in others a good deal of inflammatory action followed. On the escape of the fluid, the motions of the parts are so far regained.

Ganglia are collections in the bursæ, of various sizes, about the wrist. They are situated more frequently on the fore than on the back part. Sometimes they occur, small, on the sides of the fingers. At first they are attended with pain, afterwards with inconvenience only. The swelling is usually globular; but when large, as on the back of the wrist, the form is rendered irregular by the pressure of the tendons. The cyst is generally of considerable thickness, the fluid glairy and albuminous. They present an unseemly appearance, and when awkwardly situated, retard the motions of the limb. Frequently they form without apparent cause; sometimes they are attributed, and perhaps rightly, to a twist or over-exertion of the wrist, like windgall in hard-wrought horses, who have been put to work when young, and before their full strength has been attained. The affection is most frequently met with in females of the lower ranks; in them the structure of the limbs is more delicate than in males, and they are often obliged to use great exertions with the upper extremities before the growth of the body is completed.

Friction is of no use. Continued pressure on the swelling, by coins or small pieces of lead bound down for weeks or months, is very seldom followed by cure. If the tumour is placed over a bone, sudden and firm compression should be made with the thumb, so as to rupture the cyst, or with the same view it may be struck sharply by an obtuse body. The contents are thus extravasated into the cellular tissue, and are speedily absorbed; the cyst inflames, and becomes obliterated. Sometimes the excitement is insufficient for complete closure of the cyst, and the swelling returns. When the cyst is thick, the tumour of long duration, and the person impatient of pain, it may be punctured by a cataract needle of any kind; one thin and double-edged is probably the most convenient. The instrument is introduced through the skin, at some distance from the swelling; and, by moving the point of the needle after penetration, the cyst is divided freely. The needle is withdrawn, and the orifice closed by the finger. The contents are then squeezed into the cellular tissue, and this is followed by the same favourable results as in the preceding method. Removal of such tumours by dissection is unnecessary, and also attended with risk. I have removed several large ones by incision; but the whole cyst can seldom be taken away, and there is great risk of inflammation ensuing, followed by sloughing of the tendons, or by rigidity of the part. From my experience of the unfavourable consequences of incision, I should not again adopt such a proceeding. Setons have been passed through the swellings, but I cannot attest either their efficacy or their safety.

Exostoses of the phalanges of the fingers are rarely met with. Sometimes bony enlargement occurs, involving many of the phalanges along with several of the metacarpal bones. In such cases, both hands are often similarly diseased, and other parts of the osseous system also affected. When the tumour is limited to one or two fingers of one hand, then, to get rid of the deformity and inconvenience, the patient may desire its removal. The whole of the bone affected should be taken away, lest the disease be reproduced.

Spina ventosa, acute or chronic, more frequently the latter, is sometimes met with in the metacarpal bones, or in the phalanges. The same treatment is applicable here, as that already detailed in regard to similar affections of the lower jaw. Amputation above the tumour may sometimes be necessary.

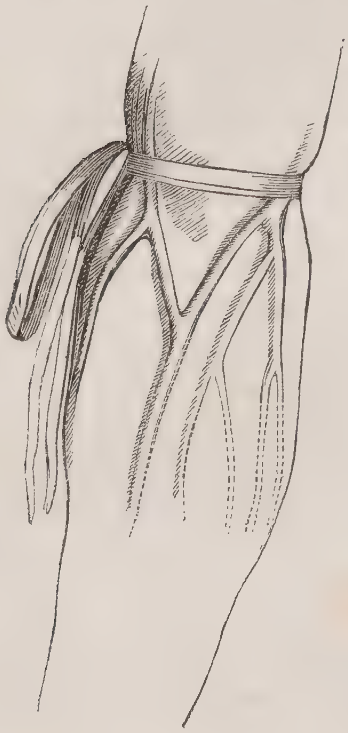
The hands of infants are sometimes found deformed, turned inwards, as the feet are more frequently. Some of the carpal bones are compressed, from the awkward position of the limb, but become properly developed, if the parts are placed in their proper position as soon as the deformity is observed, and kept so. But the displacement is unmanageable if long neglected. Congenital deficiency of the fingers is a deformity and inconvenience, but cannot be remedied. Adhesion of one or more of the fingers, even to their points, is met with occasionally as a congenital affection. Separation is readily accomplished; but the dressing requires to be carefully attended to. Adhesions may result from careless management of extensive abrasion or ulceration, or from a burn, and such are not so easily remediable. Superfluities may be abridged. Some children are born with two thumbs or two little fingers; these have generally only a cutaneous attachment to the rest of the hand, and that is easily divided by the knife or scissors. The redundancy should properly be removed by the obstetrical practitioner, as soon as it is observed.

The Bursa over the Olecranon Process is liable to enlargement, by gradual accumulation of the secretion, in consequence of habitual pressure on the elbow. The contents are either serous or glairy, usually the latter, and the swelling is indolent. But acute swelling not unfrequently takes place in this situation, from external injury; then the tumour is formed rapidly, there is heat and pain in the part, and the integuments are discoloured around; in such cases the bursa is filled with pure blood, or with a sero-purulent and bloody fluid. Inflammation of the bursa often follows bruises and lacerated wounds, and is apt to extend to the forearm and arm; causing extensive and deep effusion, great tension of the parts, and severe constitutional disturbance.

In the chronic cases of bursal enlargement, pressure is to be avoided; and by the permanent application of an ammoniacal or of a gum and mercurial plaster, absorption of the fluid may in general be procured — the swelling disappearing as gradually as it arose. If the collection is large and obstinate, repeated blistering may be had recourse to; and if that fail, a seton may be passed through the cavity. But the last-mentioned practice is sometimes followed by more action than is desirable, inflammation of the surrounding cellular tissue supervening, and abscesses forming, perhaps extensive. When the collection is purulent, a free opening is to be made into the bursa, and the case treated in other respects as a common abscess. If indolent swelling of the cellular tissue, and spongy thickening of the synovial surface of the bursa, remain after incision, the application of the caustic potass may be required. In extensive and acute inflammation spreading to the surrounding parts, free incisions are often necessary, along with proper constitutional treatment, in order to prevent destruction of the cellular tissue and skin.

Venesection, at the bend of the arm, is too often resorted to by thoughtless or ill-educated practitioners, to the detriment of the patient; as after accidents before reaction has occurred, in local pains not inflammatory, &c. It is very often had recourse to by those who have no correct ideas of the actions of the animal economy, who have not within their heads a peg to hang an idea upon; or, if they have, they are too lazy to think and to combine their ideas, so as to come to a proper conclusion regarding what is the most proper and judicious course to be pursued in any one case. They follow a routine, and bleeding is too generally the commencement of it.

But venesection is absolutely required in many cases, and must often be the principal dependence of the surgeon for removing or preventing evil consequences. After injuries, when the circulation has been restored, particularly when parts important to life are involved — in the first stage of inflammatory attacks, with violent constitutional disturbance — in inflammatory affection of vital or important organs — in these, bleeding is employed to an extent sufficient to control the action. But, even in such circumstances, the practitioner must be cautious not to push depletion too far, but to stop short at the proper time, so that the life of the patient may not be endangered, nor his health impaired, more by the treatment than by the disease.



Venesection is usually practised on either the basilic or the cephalic vein, or else on the median basilic or the median cephalic. The vein is made to rise by obstructing the return of the blood by a ligature on the arm, applied not so tight as to prevent the flow in the arterial branches. A vessel removed from the inner side of the tendon of the biceps,—that is to say, not over or near the brachial artery,—is to be preferred. But sometimes none sufficiently large or distinct can be perceived unless in that situation, and then great caution is necessary in making the puncture; the patient's arm must be held very steady, and care taken that the instrument does not transfix the vein. The branch chosen should also be fixed; one which rolls under the finger is pierced with difficulty. The vessel is secured by the thumb of one hand placed immediately below the point to be punctured, whilst the lancet is held loosely betwixt the thumb and forefinger of the other; and the surgeon should by practice acquire the use of either hand for this and other minor operations, being thereby saved much trouble and awkwardness. The right hand is used for the right arm of the patient, the left for the left. The lancet should be in very good order, not too spear-pointed, fine, and with a keen edge. The blade, placed at right angles with the handle, and held lightly, as above mentioned, is entered perpendicularly to the vessel. The puncture is made deep enough to penetrate the vein, and then the edge is carried forward more than the point, that the opening in the integuments may be more free than that in the vein. The most convenient line of incision is obliquely across. The pressure of the thumb is relaxed whenever a utensil is conveniently placed for the reception of the blood; and the arm is kept in the same position as during incision, that the openings in the integument and vein may correspond. Unless this be attended to, the skin will overlap the puncture in the vessel, and thus the stream will be completely obstructed, or at least the blood will not come away so smartly as at first. The blood may also cease to flow quickly from over-tightness of the ligature, and from threatening of syncope; in the former case the ligature is adjusted, in the latter the patient is placed in the recumbent position. When the superficial veins are emptied, the blood flowing by those deep-seated is to be directed to the wound by muscular action; with this view the patient is made to grasp the lancet-case, or any other solid body, in his hand, and turn it round. If the opening in the integument is too small, the flow gradually diminishes, and at length stops, in consequence of blood being insinuated into the cellular tissue, coagulating, and so forming what is termed a thrombus, which plugs the wound. When a sufficient quantity has been obtained, the ligature on the arm is removed, and pressure made below the wound. The integuments around are washed and dried; and two or three small compresses of lint placed on the opening, one above the other, are retained by a riband or narrow bandage, applied in the form of the figure 8; the bandage should be so tight as to prevent the escape of blood, without arresting the flow towards the heart. The arm should be disused for a few hours; and after twenty-four or thirty-six hours, the bandage may be removed, when the opening will usually be found closed.

Besides puncture of the humoral artery, or of its branches, other unpleasant circumstances may follow this little operation. The thrombus — a small bloody tumour from infiltration into the cellular tissue around the opening in the vein — proves troublesome, as already remarked, by preventing the flow, and may render a fresh opening necessary, either in the same arm or in the other. Afterwards it generally disappears gradually by absorption; or the opening in the integuments may not close, and the coagulum be separated and discharged after some days.

Inflammation and abscess round the opening sometimes supervenes. It is treated by fomentation, poultice, and rest, and the matter must be evacuated by free incision. Inflammation of the surface, with diffuse infiltration into the cellular tissue, is also met with after venesection; the treatment of such an affection is the same as when it occurs in other situations and circumstances.

The symptoms and consequences of inflammation of the vein have been already detailed. The affection is attended with great pain, and with swelling from effusion into the cellular tissue around the course of the vessel; the integuments are inflamed and tense; sero-purulent secretion soon takes place in the infiltrated cellular tissue, both deep and subcutaneous, followed by sloughing, and separation of the skin from its subjacent connexions; even death of the muscular structure sometimes ensues — the pectoral muscles have been found black and soft. The local treatment must be active. Incisions are made early into tense parts to prevent internal mischief; and if the vein in the neighbourhood of the wound be filled with pus, it should be laid open freely. The evacuation of the matter affords great relief; afterwards bread poultices or water-dressings are to be applied to the wounds, the other parts should be assiduously fomented, and attention given to the position of the limb. The bowels are to be attended to, and the secretions promoted by mercurials with stimulants, as camphor with calomel, or the hydrargyrum cum creta. When the tongue gets moist at the edges, tonics and stimulants of a more permanent and powerful action are necessary.

I have not witnessed any bad effects of venesection attributable to puncture of the tendon or fascia, or to partial division of twigs of the cutaneous nerves. In spasmodic or painful affections arising from the latter cause, slight extension of the incision is recommended, so as to divide entirely the injured branch.

Inflammatory tumour of the *Mamma* occurs generally during lactation;* and is attributable to injury, perhaps slight, during the then excited state of the secreting vessels — to sudden exposure to cold — to interruption to the flow of the secretion. It occurs, however, independently of this state — sometimes at the age of puberty, during the development of the gland — or at other periods of life, either spontaneously, or in consequence of external violence. The last class of cases are usually more severe than those first alluded to;

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* [*Encysted tumours* of the breast containing milk are sometimes met with. They are commonly produced by closure of one or more *lactiferous ducts*, either from the effusion of lymph, or some other accidental formation, or from external pressure. The swelling, which generally arises during the early months of lactation, may be globular, ovoidal, or pyriform, and rarely exceeds the size of an orange. It is almost always attended with a peculiar sense of distention, and distinctly fluctuates under the finger. On cutting into it the contents are found to be of a whitish colour, and of the consistence of milk, cream, or whey; the quantity ranging from a few drachms to several ounces.

A most singular and instructive case of this disease is reported by my distinguished friend, Professor Parker, in the *New-York Medical Gazette*, for January, 1842. The woman, who was thirty years of age, was the mother of five children, the youngest nine months old, and had always enjoyed good health. The swelling occupied the right breast, and was first noticed about three months after her confinement: it was free from pain, and without tenderness on pressure. The skin was a little more vascular than in the sound state, the veins were enlarged, and there was evident fluctuation. The child had nursed from both breasts. With a trocar, not less than three quarts of milk were drawn off at one operation! Professor Parker requested the woman to wean her child, and to return to his *clinique* in a week. At the expiration of this period the fluid had reaccumulated to the amount of three pints. In a fortnight thereafter it was evacuated a third time, but in what quantity is not stated. Since then, as the professor has recently informed me, he has not heard from his patient; and it is, therefore, uncertain how much, if any, she has been benefited by the operations in the way of a permanent cure.

Small swellings of this kind rarely require any treatment beyond the application of some stimulating embrocation, to promote the absorption of the effused fluid. When the accumulation, however, is very large, as in the case above mentioned, it will be necessary not only to evacuate the milk, but to obliterate, if possible, the sac. This may be done, I conceive, either by stimulating injections, such, for example, as are used for the radical cure of hydrocele, by the introduction of the seton, or by laying open the tumour, and wearing a tent. In the former case, which, on the whole, I should prefer, assistance might be derived from methodical compression. Diminishing the quantity of milk by weaning the child would be an important preliminary step. — Ed.]

some are more indolent than others; almost all are preceded by shivering. There is swelling of the part, a sensation of weight in it, and dull pain; then throbbing heat, and increase of suffering. The surface is inflamed, and the nipple concealed by the tumescence. The milk cannot be withdrawn. Fever attends, more or less violent. Such tumours seldom if ever subside or are resolved; suppuration takes place, and the matter generally comes to the surface at more than one point. This abscess originates in the substance of the gland; but collections occasionally form in the cellular tissue beneath the mamma, either spontaneously, as in bad constitutions, or in consequence of injury. In either case, and particularly in the latter, the swelling is great, and the suppuration extensive; troublesome and tedious sinuses remain unless early and free openings are made.

Leeching is of little use in mammary swelling during lactation; cold and evaporating lotions seem to do harm by producing determination from the surface to the deeper parts. The gland is to be kept as free from secretion as possible, and supported by a handkerchief tied round the neck; moderate diet should be enjoined, and laxatives given occasionally. Fomentations are beneficial at first, but are superseded by poultice when matter appears to have formed and to be making its way to the surface. Two or more openings are generally necessary, to afford free outlet to the matter; indeed, an incision is indicated wherever the integuments are elevated, thin, and shining. Afterwards poulticing is continued for some days, and succeeded by other suitable applications. The discharge seldom ceases, so long as the secretion of milk is encouraged.

Adolescent males are sometimes affected by troublesome fulness and uneasiness of the mammillæ. Little or no treatment is required, the inconvenience subsiding gradually and spontaneously.

Indolent enlargements of the mammary gland occur, though rarely. They sometimes attain an immense size; and are often attributable to the menstrual discharge having been inopportunely arrested. Such tumours have, from their great bulk, required extirpation.

Sarcomatous tumours of various kinds are met with, either in the cellular tissue under the mamma, or in the substance of the gland — tumours not of the gland, though in it. Such are generally traced to injury, as to a bruise by falling against the corner of a table or chair, an accidental push from the elbow of another, &c. Simple sarcoma is the most frequent formation; but I have encountered tumours, thus situated, of a worse nature — reproduced, though freely and fully removed; in fact, taken away along with the gland and neighbouring adipose substance.

The gland itself is most frequently affected by carcinoma. Sometimes it is attacked by, or involved in, medullary sarcoma; and bloody tumours are also met with. In some cases, the gland is enlarged and softened, and penetrated by cysts of greater or less size, and more or less numerous, containing a fluid either serous, albuminous, bloody, or thin and black.

The appearance and progress of carcinomatous and other tumours have been already described. The mamma is more frequently the seat of malignant disease than any other gland; it is frequently excited, and much exposed to injury. Often the induration following abscess remains stationary for several years, and at length takes on a new action, forms morbid deposit, and is of rapid growth. The disease seldom occurs in young subjects; though I have met with several well-marked cases under thirty. Before that time of life, the tumour is generally of a strumous nature, and this should not be confounded with the malignant; for the one is remediable under the influence of constitutional means, the other is not. Malignant disease is in most cases developed about the period when the menstrual discharge ceases; when the discharge is irregular previously to its entire cessation, the mamma is excited, and then hardness is perceptible. The disease also forms, though seldom, long after the "critical period," but in such cases its progress is usually slow. It occurs, also, and not unfrequently, in those who have never had the mamma excited by lactation; the mammilla is also subject to malignant disease in males advanced in life.

When the malignant nature of the disease is recognised, the tumour should be extirpated without delay, before it has made much progress — before it has contracted extensive adhesions, or contaminated the lymphatics. The circumstances rendering interference unadvisable have been fully spoken of when treating of tumours generally. If the patient is a female, the period of the menstrual discharge, if still regular, must be attended to, and avoided; indeed this maxim should apply to every operation on the female. The most favourable time for operating is some days after the cessation. The position of the patient should be sitting, unless the dissection is expected to be tedious; but it ought not to be so, — the extirpation of glands, or the detachment of the tumour from parts to which it may have contracted firm adhesions, can alone cause delay; and when these circumstances exist, interference is not allowable. Any warrantable operation on the mamma can be completed in a very few minutes. Two elliptical incisions are made from the border of the pectoral muscle, in the direction of the fibres, embracing the nipple and any portion of the integument which may be adherent or altered. The surgeon need never hesitate to sacrifice the nipple, for in this disease it can be of no further use; besides the malignant action is apt to return in it when saved, it being almost always adherent to the tumour: it must be removed. The incisions are made quickly with either a scalpel, or a sharp-pointed and broad bistoury; the lower should be the first, that the flow of blood may not interfere with it and obscure its course. This is carried at once through the skin and subjacent adipose tissue, and then the upper is made rapidly, to get over the most painful part of the operation as soon as possible. The dissection is next proceeded in, from the axillary region forwards, and the tumour detached first on one side, and then on the other. A few strokes of the knife will separate the remaining cellular attachments to the fascia of the muscle, or of the fascia to the muscle. The surface of the wound and of the extirpated mass should be carefully examined, so that no part may remain whose structure is altered.

The vessels are tied; and after oozing has ceased, if sufficient integument has been saved, the edges of the wound are put together and retained. The patient is placed in bed, with the head raised and the arm slung.

Operation is scarcely justifiable when it is evident that the absorbents are affected. Yet a small glandular tumour on the border of the axilla, without any enlargement more deeply seated, may be removed along with the mamma. With this view, the incisions should be made so as to include the tumour, and detach it previously to the mamma being interfered with. But when swelling has taken place deep in the axilla, it is impossible to ascertain its exact extent, and it may be considered very certain that a chain of altered and enlarged glands lie along the course of the axillary vessels. The whole of such a tumour cannot be taken away, and, in removing even the more prominent and accessible parts of it, there is great risk of wounding the axillary vein. This blunder I have seen committed more than once, and I have also seen the vein, the artery, and the majority of the nerves, all included in one ligature in order to stop the bleeding. I need scarcely add that the patients soon perished. When enlarged glands are perceptible above the clavicle, or in the intercostal spaces, the practitioner who would advise interference with the original tumour must be grossly ignorant, or very unprincipled.

After removal of the mamma for carcinoma, in favourable circumstances, some patients remain healthy. Those practitioners who do not recognise the malignant disease, and operate for every tumour, and at all ages, have boasted of great success. But it is not so with those of mature experience. The *disposition* to malignant action often remains latent for many months, sometimes for many years, and at length becomes fully developed. The disease may return in the skin; the cicatrix hardens, ulceration occurs, and makes progress. Or tubercles form in the cellular tissue, enlarge, and involve the skin. Or the glands become tender and swell; and the swelling is often unattended with uneasiness. Œdema of the hand and forearm, to a great extent, may have existed for a considerable time, and on examination extensive glandular tumours are detected in the axilla and above the clavicle. These, perhaps, ulcerate; or cough and hectic cut off the patient. In short, permanent riddance from mammary carcinoma is scarcely to be expected by operation, or any other means.

Neither are operations for medullary and bloody tumours of the mamma more successful in their results; though I have certainly witnessed permanent cures under unpromising circumstances,—when the tumours were large, of long duration, and even ulcerated.

AFFECTIONS OF THE CHEST.

Inflammation of the pectoral serous tissue would come to be considered more properly in a work exclusively on the practice of physic; but the affection not unfrequently occurs in consequence of wounds or other external injuries, and its terminations must be shortly noticed.

Effusion of serum may take place into the cavities, attended with subsidence of the symptoms of pleuritis. In such circumstances, the lung collapses, either entirely, or still admits a small quantity of air; and, if the collection lodge for a considerable time, that side of the chest enlarges. When the cavity is not quite full, the fluid is heard to be troubled, and on motion of the trunk a sound of splashing is perceived. Part of the cavity may be occupied with air which has escaped from an opening in the lung; or halitus may be extricated from the accumulated secretion. There are other signs, sufficiently distinct, imparting a knowledge of such effusion. The previous history of the case leads to a shrewd suspicion. The chest is unnaturally immovable, as well as enlarged; the intercostal spaces are widened, and ultimately protuberant; there is dulness on percussion, and no respiratory murmur perceptible in those parts where there is fluid; the sounds are natural in that part of the lung which is permeable to air, and distended.

Suppuration often is the result of the incited action; and purulent matter forms in the cavity of the pleura, generally without breach of surface. The membrane is covered with lymph, more or less extensively organised. *Empyema* is established. Suppuration may take place in the substance of the lungs, and from ulceration the matter may escape, in small quantity at a time, into the bronchial tubes, giving relief to the patient; or it may be poured in profusely and suddenly, so as to cause instant suffocation; or it may work its way into the cavity of the pleura, and occupy the same place as if it had been secreted by that membrane. Or, again, if the lung adhere to the costal pleura, the matter may approach the surface of the body, by the aid of interstitial absorption of the intervening parts, and the collection may then be opened, like a common superficial abscess, by division of the integuments only.

When the pleura is full, the chest enlarges, the integuments become œdematous; and if, from the preceding and collateral circumstances, no doubt exist of the presence of matter, paracentesis may be performed with a chance of relieving and saving the patient. The patient is placed horizontally, with the shoulders slightly elevated; and the affected side should be as dependent as possible, that he may be readily turned over on his face should the breathing become embarrassed. The position of the diaphragm, in regard to the inner surface of the false and lower true ribs, must be kept in view. When the distention is great, this important muscle is displaced; it is pushed downwards, carrying before it the viscera in the upper part of the abdomen; it is thus removed far from the place at which the incision is usually made. The point of election, as it is called, is between the fifth and sixth ribs, and midway between the sternum and the spine. An incision is made through the integuments, over the upper edge of the sixth rib, an inch and a half in extent; in this situation there is no risk of wounding the intercostal artery. If the operator intend to shut the cavity as soon as the fluid has been discharged, the integuments are drawn upwards previously to making the incision, in order that they may afterwards overlap the wound. A cautious opening is then made through the intercostal muscles, and the pleura punctured. This is immediately followed by forcible ejection of fluid. The wound of the pleura is then enlarged by a probe-pointed knife. The thrust of a trocar, or sharp-pointed bistoury, is here inadmissible, as in some cases the diaphragm, perhaps the liver or stomach, or even the lung, might be wounded. The fluid at first escapes rapidly; afterwards it is ejected chiefly during expiration. After its discharge, a tent is placed in the wound, over which a compress is put, and the chest is firmly bandaged. The closure cannot be maintained safely longer than twenty-four hours; the dressing must be undone, the tent removed, and the matter again allowed to flow. I would certainly not recommend any attempt to heal the wound by the first intention. In consequence of continued closure, the secretion soon becomes very profuse, mixed with blood, and of a putrid nature; irritative fever is established. The treatment principally consists in obtaining gradual, and at the same time free, evacuation of the fluid, restraining the motions of the chest, and supporting the general strength. As the discharge ceases, the lung may in part expand; it may, however, continue collapsed, become consolidated, and the chest fall in. In neglected cases, absorption of the intercostal substance takes place; the integuments bulge outwards, and distinct fluctuation is perceived. The skin has been allowed to become thin, and even to give way, without the nature of the case being known; but this can be the result only of ignorance or of inattention. In such cases the ribs have been denuded, and become necrosed to a large extent, — the sequestra separating slowly and in fragments, and causing long-continued and wasting discharge. It is plain, therefore, that pointing of the matter should never be waited for. Chronic collections are occasionally met with of some years' duration, and producing great enlargement of the chest. Surgical interference with such is less likely to prove beneficial than with the acute.

Wounds of the large bloodvessels of the chest, or of the cavities of the heart, are almost immediately fatal. Mere punctures, however, of these parts, have closed for a time, and in some cases even permanently. All wounds of the chest, though not involving bloodvessels of a large size, are productive of severe consequences — effusion of blood or bloody fluids into the cavities, escape of air into the external cellular tissue, collapse of the lung, and inflammation and its results, are always to be dreaded. The danger is not uniformly tantamount to the extent of injury inflicted. Individuals have recovered from extensive wounds causing profuse hemorrhage, and great displacement and laceration of the parts; whilst, from much slighter injuries, untoward and fatal consequences have quickly resulted. Wounds may penetrate the chest, and be continued into the abdomen; the stomach, liver, and intestines — one or all — may be perforated as well as the lung; in such cases the hemorrhage is in general speedily fatal. Injury of the intercostal arteries, and of the mammary and its branches, is attended with serious bleeding. It is easily arrested, however, by pressure. A piece of fine linen is pushed into the wound, followed by charpie, so as to form a small bag within the chest, a little larger than the opening; by pulling this gently outwards and fixing it, efficient pressure is made on the bleeding vessel. At the same time the motions of the chest are to be restrained by bandaging; indeed this is necessary in almost all injuries of that part. When reaction has been established, antiphlogistic treatment must be pursued, and it generally requires to be extremely active. Bloody, serous, or purulent fluids, lodging in the cavity of the pleura, are to be evacuated, if need be, either by incision or by enlargement of the original wound. In the course of the cure hectic usually supervenes to a greater or less degree, and requires the reverse of the previous treatment.

AFFECTIONS OF THE ABDOMEN.

Inflammation of the peritoneum, when idiopathic, is generally treated by the physician. But it occurs in consequence of wound, obstruction from hernia, or affection of the lower bowels. There is a burning heat in the belly; the pain is constant and increasing, much aggravated by the slightest pressure or exertion of the abdominal muscles, and the patient, in consequence, lies with these muscles in a state of relaxation. The pain is of a very different character from that arising from spasm, induced by the irritating nature of the intestinal contents, which supervenes in paroxysms, and is relieved by pressure or by evacuation. In inflammation the countenance is very anxious, and generally pale; the extremities are cold and bathed in perspiration; the patient vomits frequently; and the bowels are generally constipated. The pulse is small, wiry, and rapid.

Hernia has been classed with tumours. It is a swelling, but of a peculiar kind, and attended in some states by peculiar symptoms. The term rupture is in common use instead of hernia, but was at first applied from a false notion of the disease. There is a descent of viscera, but not often rupture of the parietes. By hernia is meant protrusion or escape of the contents of any cavity, but the term is most frequently applied in regard to the abdomen. The protrusion may occur at various parts of the abdomen; through the diaphragm, constituting *Phrenic* Hernia; through the umbilicus, constituting *Exomphalos;* through the dilated apertures for transmission of vessels, constituting *Ventral* Hernia; through the inguinal canal, constituting *Inguinal* Hernia; through the crural aperture, constituting *Crural* or *Femoral* Hernia. The most frequent forms are the inguinal and crural, — the effects of pressure or action of the muscles on the abdominal contents being concentrated towards the lower part of the cavity. It is but rarely that the bowels protrude through the sacro-ischiatic notch, or through the obturator foramen, or by the side of the vagina, or betwixt the bladder and rectum.

It is of great importance for the student to study attentively and reflect on both the healthy and morbid anatomy of this disease. When a hernia is strangulated, there is an absolute necessity for early interference; the bowels are obstructed, and their action inverted; feculent vomiting ensues, and enteritis is threatened, with all its dangerous consequences. He may meet with the affection at a very early period of his practice, and may be so situated as to command no assistance or advice; he must be guided by his own judgment and knowledge. He should be well aware of the relations of the parts to each other, and the changes likely to have been occasioned by the disease. If, through delay, the patient lose his life, or if an operation be attempted, and its object improperly accomplished, or not accomplished at all, his reputation may be blasted. But if he interferes skilfully, and at the proper time, and save his patient, relieving him at once from all his painful and dreadful symptoms, great credit and professional fame may be in consequence acquired. An examination of the healthy anatomy is not sufficient; many changes take place, which mere anatomical and physiological knowledge could never anticipate. Extraordinary displacements and adhesions occur. The parts are altogether changed; and repeated examination of the morbid state alone can impart the requisite knowledge to one previously well acquainted with the healthy structure.

In consequence of laceration or separation of fibres, hernia may occur suddenly, and even in the best formed parts, from very violent exertion — as in leaping, wrestling, pulling, lifting heavy weights; from sudden exertion of the abdominal muscles in any way; from blows, &c. Or the protrusion may come on gradually, after slight exertions, where the tendons are naturally weak or deficient; or it may be slowly induced by repeated and almost constant muscular action, as in urinary, intestinal, and pulmonary complaints: in such cases, slight pain is usually felt at the site of the protrusion before the tumour is perceived. The disease is often congenital. But the common cause of abdominal hernia is powerful action of the abdominal muscles, compressing the viscera to a greater or less degree, and with more or less suddenness; the viscera resisting the compressing force, react on the parietes, and these, yielding at the points which are naturally weak or deficient, permit enlargement of the coerced cavity by protrusion of part of the contents. When the compression and reaction are sudden and violent, the protrusion is the same; but when the former are not sufficient to overcome the cohesion of the parietes by a single occurrence, by repetition the morbid end is gradually effected, the hernia is proportionally slow in making its appearance, and gradual in its increase.

To understand the nature of *congenital scrotal hernia*, the student must recollect that the testicle in the fœtus is lodged in the cavity of the abdomen immediately below the kidneys, and resting on the psoas muscle; that it gradually descends into a process of peritoneum, called spermatic, which extends from the general peritoneal cavity down towards the scrotum, and which ultimately constitutes the tunica vaginalis. The orifice of this peritoneal pouch not closing immediately after the descent, may permit a fold of intestine to slip into its cavity, and remain in contact with the testicle. Or the testicle may, though rarely, contract in the abdomen an adhesion to a portion of bowel, and in its descent bring this along with it. In either case the bowel remain in its new situation, and constitutes congenital hernia.

Hernia infantilis differs from the hernia congenita, and is a kind of protrusion peculiar to the early period of infancy. In the congenital form the protruded intestine is in immediate contact with the testicle, and surrounded by the tunica vaginalis testis; but in hernia infantilis a process of peritoneum is interposed betwixt the intestine and the vaginal coat. The affection occurs after the abdominal aperture of the spermatic process has closed, but before the rest of that process has become incorporated with the spermatic vessels and their surrounding cellular tissue. In fact, only the peritoneum proper has closed, and forms the septum between the cavities of the abdomen and of the tunica vaginalis; but being insufficient to withstand the impulse of the abdominal contents, yields before it, and descending along with the protruding portion of bowel, forms its envelope, or the proper hernial sac, within the cavity of the tunica vaginalis.

Such is the opinion generally adopted in regard to the nature of hernia infantilis; but its accuracy is doubtful. It seems more probable that the bowel, covered by a fold of peritoneum, is protruded into the cellular tissue of the spermatic chord, after closure and contraction of the spermatic process, and descending till it reach the upper and posterior part of the tunica vaginalis, adheres to this tunic, bulges it forwards, and is covered by it. On cutting down in such a case, the hernial tumour may appear to be lodged within the tunica vaginalis; whereas the bowel is actually placed exterior to the tunic and behind it. Indeed, the case is similar to the common scrotal hernia, only the tumour is behind, not anterior to the vaginal coat. And this relation of parts is more apt to occur in the infant than in the adult; for in the former the testicle does not for some time descend fully into the scrotum, and whilst it is lodged in the groin a fold of peritoneum protruded into the spermatic chord may soon contract adhesion with the tunica vaginalis, afterwards descending along with it and the testicle. The subjoined case, illustrative of the preceding statement, came under my observation in 1814. — J. S., æt. 21, was admitted into the Royal Infirmary, with symptoms of strangulation which had been of eight days' duration. The hernia had existed from infancy; it was on the right side, and tolerably large. In the operation, on dividing the integuments and various coverings, a sac was opened, which proved to be the tunica vaginalis, containing the testicle, a considerable quantity of serum, and a large, smooth, transparent tumour above the testicle and behind the posterior layer of the tunica vaginalis. The operator was puzzled, but finally determined on cutting into this tumour; it proved to be the hernial sac, covered by the tunica vaginalis, containing three or four ounces of serum and a portion of omentum. The protrusion could not be returned; after relieving the stricture, the omentum was cut away, and the bleeding vessels tied separately. The patient died on the third day after. An analogous case is on record; and a third has been related to me by an old and experienced surgeon: in that instance, both the anterior and posterior layer of the tunica vaginalis, together with the true sac, were simultaneously divided; omentum and intestine protruded into the vaginal coat, and for a time the opening through the posterior part of that cavity and sac was mistaken for the inguinal ring. On extension of the incision, the nature of the case became more apparent, the stricture was relieved, and the protrusion reduced. A case, in many respects similar to those above described, occurred a few years ago in my practice at the North London Hospital. It is recorded in the *Lancet* and in the *Practical Surgery.*

Children are sometimes born with deficiency of the umbilicus, and protrusion of bowel into the loose cellular tissue of the umbilical chord; the disease is termed *congenital exomphalos.*

Almost all the viscera of the abdomen and pelvis are liable to protrusion — the stomach — the spleen — the omentum — the great and small intestines, and even some of their most fixed parts — the ovaria — the bladder. Also, right portions of the viscera occasionally escape on the left side of the parietes, and the left at the right.

Hernial protrusion has received different names, according to the nature of its contents. When composed of a portion of intestine, it is termed *Enterocele ; Epiplocele,* when composed of omentum; and *Entero-epiplocele,* when both intestine and omentum have escaped; and, as already observed, different names are also applied, according to the situation of the protrusion.

The inguinal and crural forms of hernia being the most common, will chiefly occupy our attention. The inguinal is divided into *true* or *oblique inguinal,* and into *direct* or *ventro-inguinal.* In the oblique, the protrusion passes along the inguinal canal. This course is in young persons short; but as the muscles become developed it is lengthened to about two inches, reckoning from the external ring to the funnel-like opening through the transverse fascia. The appearance of the swelling in this canal leads to diagnosis betwixt the oblique and direct hernia; but in chronic cases, this distinction is often in a great measure done away with. In large and old oblique ruptures the neck of the tumour is shortened, and the openings of the canal are approximated and more in a direct line. They are also immensely dilated, being often enlarged to such an extent as to admit all the fingers of the hand, when placed in a conical form, — and this even in the living body, the loose integument receding along with the tumour. The epigastric artery is situated behind the neck of the sac, on its inner side; and it is much displaced inwards in cases of old standing. The direct hernia passes through the parietes opposite to the external ring, and does not come in contact with the spermatic chord until it has reached that point. Its neck is short, and the epigastric artery is on its outer side. The coverings of the two tumours are different. Those of the oblique are such as the chord possesses — a prolongation of the transverse fascia, a covering from the cremaster muscle, fibres from the edge of the external ring, and the superficial fascia of the abdomen. The direct has only the last. A very old woman was operated upon in the North London Hospital a few days ago, for strangulated hernia of several days standing. The tumour was high in the inguinal region: on cutting down upon it, the tendon of the external oblique was found to cover it completely. The external ring was occupied by a mass of fatty matter, which probably had been displaced. The tendon was divided, and the sac, of considerable size, exposed. The opening through which the protrusion had taken place was very small, and situated a good deal to the mesial line of the internal aperture of the canal. The hernia was at the time of operation supposed to be ventro-inguinal. The patient was relieved for a time, but eventually sunk exhausted. An opportunity was thus unfortunately afforded of verifying the opinion formed. The hernia had two proper coverings, the superficial abdominal fascia and the tendon of the external oblique. The opening was inside the epigastric. The portion of bowel which had been extruded and returned was very tender, but it had adhered to the peritoneum, close to the place where it had been confined.

The oblique inguinal, when recent and small, is termed Bubonocele; but when large, it generally descends into the scrotum — oscheocele — of course exterior to the tunica vaginalis; and in females into the labium. The tumour often attains an immense size, from continued application of the causes that produced it, — laborious occupations, or straining of muscles in any way. When of long duration, and not attended to, it is not uncommon for the swelling to hang as low as the middle of the thigh, or even down to the knee. In such cases, the testicles often are wasted, and the penis concealed; indeed the skin of the penis, as well as of the lower part of the abdomen, is stretched over the tumour. Crural or femoral hernia is, on the contrary, seldom larger than a small apple. Sometimes, but very rarely, the tumour is of large dimensions. I have seen one containing the transverse arch of the colon, the omentum, and a yard and a half of small intestine. The tumour is represented some pages further on.

When a very large hernia remains always full, the cavity of the abdomen diminishes in size; in fact, it adapts itself to its contents; and this must be kept in mind when interfering with such cases.

Inguinal hernia most frequently occurs in males, the femoral in females; and the reason of this is obvious on comparing the size of the inguinal and crural openings in the sexes. In the male, the inguinal opening is much larger than the femoral; in the female, the femoral is the larger, — the inguinal is small, containing only the round ligament of the uterus. The causes of hernia act equally on both openings, and therefore it is to be expected that protrusion will take place where there is the least resistance, where the parietes are most deficient.

Hernia can seldom be mistaken for any other swelling, by one at all acquainted with his profession, and who makes his examination attentively. The history, and the mode of its appearance, are to be attended to. The swelling proceeds from above — at times it recedes on the patient lying on his back and making pressure on the swelling — a distinct impulse is communicated to it on exertion of the abdominal muscles, as in coughing — the tumour is generally elastic, and its neck can be felt extending from the lower abdominal aperture. Also, the two kinds, inguinal and crural, can scarcely be confounded with each other; the former is above, the latter below, the ligament of Poupart. It will be proper, however, to enumerate shortly the diseases for which hernia may be mistaken.

Cirsocele may be confounded with inguinal hernia. Cirsocele, being a varix of the spermatic veins, enlarges on coughing and during the erect posture, like hernia; but in general the composition of the tumour can be ascertained by the feel which it imparts when handled, — the veins feel like a handful of earth-worms. Besides, the swelling is made to disappear, on emptying the dilated veins by pressure upwards; and, if the surgeon then firmly compress the inguinal aperture, the tumour will rapidly reappear, on account of the venous flow being interrupted, particularly if the patient exert his abdominal muscles, or assume the erect posture. Whereas, had hernia existed, the swelling could not have been reproduced; and, on the patient being directed to cough, a distinct impulse would have been felt with the finger. *Hydrocele* of the tunica vaginalis may be confounded with scrotal hernia, if its distinctive characters be not understood or attended to. The pyramidal swelling presents an equal surface, fluctuates, and is generally diaphanous; its formation is gradual, commencing at the lower part, and slowly ascending; the testicle cannot be readily felt at the bottom of the scrotum; there is no swelling at the inguinal canal, and the chord is felt free; the tumour is not affected by the position, motion, or exertions of the patient. These circumstances plainly indicate the nature of the case. Bubo, sarcocele, and acute swelling of the testicle, are sufficiently distinguished from hernia by their situation, form, feel, and history, and cannot be confounded with it save by the profoundly ignorant. *Hydrocele of the spermatic chord* is more likely to lead to deception when large; but it is generally small and circumscribed, involving the middle of the chord, leaving the inguinal aperture free, and the upper part of the spermatic chord distinct. Besides, whatever may be its size, its formation is always slow and indolent, — it is never capable of being pushed into the abdomen, and it is unaffected by those circumstances which contribute to mark hernia. But hydrocele of the chord and hernia may coexist, as in the following instance: — A gentleman had swelling in the course of the spermatic chord for many years, while in a warm climate. Bandages were applied, and great pain thereby occasioned. After his return to this country, pain in the belly and vomiting seized him on a Monday morning, and continued with more or less violence till the Sunday following. Then the vomiting became feculent, the belly excruciatingly painful and tender, the tumour tense, and the pulse weak. A physician opposed operative measures, having been convinced that his former complaint was a hydrocele of the chord. But I conceived that the symptoms warranted cutting down on the parts, and did so. A hernia was found containing omentum and a fold of bowel; a hydrocele of the chord lay alongside of it.

Crural hernia has been mistaken for bubo, and *vice versâ*. Lumbar abscess and varix of the femoral vein are also supposed to resemble it in some measure. The situation and form of the tumour in lumbar abscess is very different from those of hernia; and the mode of examination recommended in regard to cirsocele is equally applicable to the detection of dilated femoral vein. The distinctions between crural hernia and bubo are too obvious to require mention.

Patients with unreduced hernia are constantly in great danger; as bruising of the swelling, or accumulation of feces in the protruded bowel, are likely to occasion very unpleasant consequences. They are generally troubled with indigestion, flatulence, and constipation; a slight degree of constriction at the neck of the tumour produces an obstruction to the intestinal contents; the viscera in the sac have not due support and pressure, hence accumulations take place in them, and may be productive of serious and even fatal effects. No protrusion, in which these circumstances are likely to occur, should be allowed to exist, if possible. So afraid were the ancients of allowing hernia to remain unreduced, that it was their custom to cut all patients labouring under rupture who would submit to the operation; and this was generally performed by itinerant quacks. They returned the protrusion without opening the sac, and then the neck of the tumour was either stitched up, or tied along with or without the spermatic chord. The actual cautery, and the most powerful caustics, were also applied to the parts by some, and dreadful were the effects; yet after the neck of the sac had been destroyed, and perhaps the bone exposed and exfoliated, protrusion again took place by the side of the cicatrix. By many, castration was considered necessary for the cure of scrotal hernia. Such harsh measures were founded on erroneous and imperfect ideas of the nature of the disease, which are not often to be met with in the present day. Operations for unincarcerated hernia are not justifiable, and those who have operated in such circumstances give a very unfavourable account of the experiment.

The external applications employed to reduce hernia are various. Some are supposed to produce corrugation of the integuments, and contraction of the cremaster muscle, and thereby to force up the protruded intestine; others are of an astringent character, and their administrator may gravely believe and say, that by them he expects to tan the living scrotum, to reduce the hernia, and to present and insuperable obstacle to its reproduction. But all such means are visionary, and practically ineffectual; no external or internal remedy can attenuate and reduce the hernial sac, remove adhesion, or produce contraction of the tendinous and rigid apertures.

Herniæ are either *reducible* or *irreducible*. A hernia is said to be reducible, when the protruded bowel or viscus readily returns into the abdomen on the application of pressure to the swelling, or on the patient assuming the recumbent posture. When recent, the swelling may not be made to disappear without considerable difficulty; but, after the disease has become of long duration, the aperture through which the protrusion has taken place dilates and is relaxed, and admits of the ready passage of the hernial contents: such tumours are usually of considerable size. But reducible herniæ should not be permitted to enlarge, since their protrusion can be prevented by simple and safe means; after reduction, a properly fitted bandage, termed a Truss, is applied over the aperture and canal, and by the compression thus made the opening is rendered impervious to the abdominal viscera. In inguinal hernia, the pad of the truss must make equable compression over the whole of the canal; in the other species, the aperture is less extensive, and the pressure more direct. Perseverance in the use of a well-adapted truss is highly necessary in children from the first, so that a chance may be afforded of permanent cure by contraction of the opening and development of the surrounding parts. In young persons the canal is short, and almost direct, and from its becoming oblique and elongated during growth, prevention of protrusion may be effected. Descent must never be allowed during such attempts at cure. But in adults such a fortunate result can scarcely be expected; the truss must be constantly worn during the day — in bed it may be disused — and the patient must rest satisfied with thereby escaping those dangers to which protrusion of the hernia would render him always liable. Great care should be taken to ascertain in the morning, before the truss is applied, that no protrusion exists. If the opening be not much dilated, it may contract even in adults when protrusion is sedulously prevented. The patient will also require to avoid the causes of hernia. If he is subject to cough, or labours under bad urinary disease, by which the abdominal muscles are called frequently and fully into action, there is no chance of a cure; nothing but the continued use of a truss will afford safety.

Hernia is rendered irreducible, 1. By the formation of adhesions between the sac and the included parts. 2. By induration of the protruded omentum, and by accumulation of fat in it, or in the appendiculæ of protruded large intestine. 3. By contraction of the abdominal cavity from long-continued displacement of a large portion of its contents. 4. By the nature and connexions of the protruded part, as in hernia of the sigmoid flexure, or of the caput cœcum coli.

5. By firm compression of the abdomen. 6. By the tightness of the opening giving rise to engorgement of the protruded parts. 7. By accumulation of feces, solid or fluid, in the protruded portion of bowel. With care, some of these causes may be got over, and the tumour reduced. In irreducible hernia the use of a bag truss is indispensable to prevent increase of the protrusion. In irreducible femoral hernia of small size, a hollow pad with a weak spring is used with advantage, to give support to the contained parts, prevent farther protrusion, and guard the tumour against external violence. The patient must avoid violent exertion, keep his bowels open, and be careful of his diet; he is always in danger, and should know it. Many have lost their lives from blows otherwise not dangerous; and even straining at stool is sufficient to force additional portions of viscera into the neck of the sac, and thereby induce most serious distress. Ruptures often come down during an attack of bowel complaint, or after a dose of purgative medicine.

The term *incarceration* of hernia is employed to indicate a slight degree of *strangulation*, when the hernial contents are confined from any cause, and when the circulation in the protruded bowel and the course of the feculent matter are nevertheless uninterrupted. By many it is applied indiscriminately with strangulation.

Strangulation arises, not from any change in the neck of the sac or in the tendinous aperture, but from increase of volume in the protruded parts, caused by accumulation of the solid, fluid, or gaseous contents of the bowel, followed by interruption to its circulation; or the interruption to the flow of blood may precede the distension. The circulation is more readily retarded or arrested in the veins than in the arteries, and consequently the engorgement of the bowel is at first caused by venous turgescence; but when the flow in the arteries is at all impeded, the infiltration and exudation become more rapid, and the part quickly perishes — sphacelates. The symptoms which accompany and indicate strangulation are of a very imposing nature, and cannot be neglected; and it is fortunate that such is the case, for no disease is fraught with greater or more immediate danger to the patient, or requires more the early interference of a skilful and expert surgeon. The tumour becomes tense and painful, and the integument is sometimes red and shining; the pain is much increased by pressure, and extends over the abdomen, but continues most severe near the neck of the swelling; sickness and inclination to vomit quickly follow; the patient feels languid; his countenance soon assumes a contracted anxious appearance; the circulation is hurried; the pulse beats wiry and hard, though at first it may have been full. If relief is not afforded, all the symptoms are speedily aggravated; vomiting comes on, and is frequent; no discharge can be procured from the upper bowels, though the lower may be, and often are, evacuated by injections or by natural efforts: if the upper bowels evacuate downwards, the strangulation cannot be of the whole calibre of the gut, but only of a part. Pain and heat in the tumour and belly increase; and the former becomes very tender, and tense as a drum.

The circulation is more hurried, and restlessness and intolerable anxiety supervene. The patient becomes worse and worse every hour; feculent matter in large quantity is vomited or gulped up with great distress, and is commixed with bile, with vitiated mucous secretion from the stomach and bowels, and with whatever may have been recently swallowed; in fact, the peristaltic action of the alimentary canal above the strangulated part is inverted, and all the contents are ejected. Troublesome hiccough comes on, and this symptom is by many considered as a sure sign of gangrene having taken place; but it is often present when the bowels are quite free from tenderness or tendency to gangrene. The extremities grow coldish; the pulse is unequal and fluttering, and with difficulty counted at the ankles. The countenance sinks, and assumes a leaden hue; the pain abates suddenly; the eyes are glassy; the tumour becomes flaccid, and is often livid and emphysematous. Now, the bowel may recede, and feculent evacuation take place, with some relief; but the patient, after lying some time insensible, expires. All this may occur, either within a few days after the occurrence of strangulation, or not till after the expiration of many days. The rapidity of the symptoms and the danger are influenced by the size of the tumour and the condition of its neck, and by the nature of its contents. In small recent herniæ, the advance from bad to worse is usually very rapid, the aperture through which protrusion has taken place being small, and producing a great degree of constriction when distension and engorgement occur. When the neck of the tumour is large, and completely occupies the aperture previously to the strangulation, the progress of the symptoms is also rapid, for a similar reason; but if the hernia be large and of long standing, and if the protruded parts are not bulky at the point of protrusion, the constriction is in general not very severe, and the distressing consequences advance more slowly. The symptoms are not so violent in epiplocele as in enterocele. In many instances of the former, the intestinal discharges are never obstructed, though great irritation and inflammation may be induced by the strangulation. There is also less danger in entero-epiplocele than in enterocele, compression of the bowel being in the former instance diminished by the intervening omentum.

It is scarcely necessary to observe, that, when the train of symptoms just detailed commences in any case, the surgeon must immediately and anxiously inquire as to the existence of external hernia, for often the disease is concealed, particularly by females: all parts where protrusion is likely to occur must be examined attentively. At the same time, the surgeon must bear in mind that pain of the abdomen, with symptoms resembling those of strangulation — in fact, that enteritis, with obstruction, may exist along with hernia, but independent of it. A person with hernia is as liable as any other, if not more so, to inflammatory attacks in the abdomen from a variety of causes. The portion of bowel in the tumour may participate or not in the general abdominal affection; if unaffected, it may be reduced; it is neither painful nor tense. Again, in large ruptures, inflammation of the contents may take place without strangulation, and without affection of the parts within the abdomen. All circumstances bearing on the case must be well considered by the surgeon, before making up his mind as to the nature of the affection.

Returning the contents of the hernia into the abdomen is the only effectual means of counteracting the direful effects of strangulation; and the propriety of an early recourse to this measure must be quite apparent. It is indispensable, and no delay is warrantable. The means for accomplishing it must be varied, according to the state of the parts, the duration of strangulation, and the general symptoms. The most simple method, and that which should first be attempted in ordinary cases, is the *taxis;* that is, reduction by pressure with the hand. In this, the position of the patient is of importance; it should be such as effects relaxation of the tendinous structures through which the hernia has protruded, and through which it is to be returned. With this view he is placed on his back, with the shoulders and pelvis elevated, and in crural hernia the thigh is bent on the trunk, and turned towards the opposite side; thus the aperture is relaxed along with the fasciæ which compose it. Long ago, the positions into which the patients were forced for the cure of hernia were various, and generally awkward; they all tended towards more or less complete inversion of the erect posture, and thus it was supposed that the abdominal bowels dragged on those protruded, and thereby assisted reduction. But the viscera are equally pressed on in every position of the body; it is not they, but the external parts, that are affected by change of posture. During the attempts at reduction, the patient should be exhorted not to strain or resist, but to relax his muscles; and it will be well to engage him in conversation, that he may not have an opportunity of keeping his lungs distended, and thereby acting forcibly on the abdomen. At first the pressure should be general, applied either with one hand or with both, according to the size of the tumour, so as to diminish the contents. If air be heard gurgling at the neck of the swelling, the chance of success may be considered good, for a return of part of the bowel's contents is thereby indicated. Then a gentle kneading should be made at the neck with the fingers of one hand, while with the other general pressure is kept up. The impression made is at first slight and gradual; but, when a portion of the bowel returns, the rest of it slips up suddenly. The return of omentum is always slow, and the last part requires as much manipulation as the first. The direction of the pressure must be varied according to the case. In inguinal and ventro-inguinal hernia, it is made in the direction of the neck of the sac; in the former upwards and outwards, in the latter upwards and backwards; and previously the body of the tumour should be brought into the same line with its neck. In crural hernia the pressure must first be made towards the centre of the thigh, so as to bring the whole tumour into the same direction with its neck, and then upwards. In umbilical, the pressure is straight backwards. Small herniæ, and those of recent origin, are with difficulty reduced; their neck is narrow, and the passage proportionately small; the crural are usually of this description. In all herniæ, after strangulation has existed for some time, and adhesions formed, particularly at the neck, reduction is almost impossible.

The taxis is to be neither attempted nor persevered in after the hernia has become tender and inflamed. No good can be done by it, and the patient's chance of recovery by operation is much diminished. Even when no pain is felt in such circumstances, any degree of force must be prejudicial. Mortification of the bowels is often hastened in consequence of the taxis being unskilfully employed by ill-informed persons, who are often determined, at all risks, and at all stages of the affection, to accomplish speedy reduction of the viscera. The surgeon will take care to inform himself of all particulars — as to the duration of strangulation, the previous state of the tumour, if it was all, or only in part reducible, as to its size, &c. — before proceeding in any way. Great mischief is likely to accrue from the tumour being handled, perhaps roughly, by many people. If the taxis is gone about, however, in proper time, and in the right way, it ought almost always to prove successful. It is very desirable indeed that this should be the case, seeing that all the bad symptoms in ninety-nine out of a hundred cases instantly subside; whereas, after the reduction by incision, there is always great risk from the opening of the peritoneal sac alone.

Certain means may assist the taxis, but they should not be long continued or often repeated. Venesection can be employed only in strong plethoric patients, in the very first stage of strangulation, and before the patient is exhausted by the distressing symptoms. It is had recourse to in order to induce syncope, or an approach to it; during which general relaxation takes place, and reduction may be attempted with advantage. With that view the patient is placed erect, and a large orifice made in the vein of one or both arms, so that a moderate quantity of blood suddenly abstracted may have a powerful effect on the system. In several cases I have found this practice beneficial, but am inclined to say that, in general, it will not be followed with success. In a favourable case, one attempt of this kind may be made, but not repeated. In many states of the constitution, and in the latter stages of the disease, bad consequences must follow the practice. But in regard to it or any other remedy, it would be folly to lay down positive general rules; what may prove useful in one or two instances may answer very badly in the majority of cases that come under treatment. Local bloodletting can have no effect in diminishing the size of strangulated parts; though in inflammation of the contents of the tumour, without strangulation, no more powerful means can be employed.

Purgatives have been recommended with the view of extricating the bowel by increased peristaltic motion; but the symptoms will, to a certainty, be aggravated by their use. Purgative enemata can do little good: if in small quantity, they empty only the rectum; if large, they may reach the strangulated part, but will scarcely have the effect of extricating it.

Emetics, in full or nauseating doses, have been supposed to be indicated in this affection as well as in ileus; but there is in general enough of sickness and vomiting without them, and it is often difficult enough to allay the vomiting even after removal of the obstruction.

The warm bath is greatly trusted in by some, and in many cases it proves a valuable and useful auxiliary to the taxis. It acts beneficially by inducing general relaxation, or even syncope; during which, whilst all resistance of the compressing powers upon the contents is suspended, pressure on the tumour can be employed to good advantage. By steady perseverance, whilst the patient is in the bath, a great majority of strangulated herniæ may be reduced. But neither the general nor the local application of heat, or any other known means, save the edge of the knife, can relax tendinous apertures farther than can be effected by attention to position. Irrecoverable and most precious time may be wasted in preparing the bath; and for this reason such means should never be resorted to, unless they can be commanded at the shortest notice.

Fomentation can do no good. The apertures can be neither relaxed by heat, nor contracted by astringent applications. By the local application of heat, the size of the parts composing the hernia will be augmented, the flatus being rarified, and the effusion and engorgement encouraged.

The cold bath, and the dashing of cold water on the surface, near the seat of the disease, have been tried in some rare cases with most marked success; but this is a practice not generally to be relied on. It can act only by producing sudden and powerful contraction of the coverings, and uniform pressure thereby on the contents. It is, perhaps, only applicable to scrotal hernia. Cold has been applied to the tumour, and even ice, so as to produce frost-bite, but little faith can be placed in such; the practice becomes dangerous after inflammation has existed for some time, the application diminishing the weakened powers of the parts, and accelerating gangrene.

Opium has been given by the mouth, and tobacco by the lower extremity of the alimentary canal; the former may sometimes prove advantageous, but the latter had better be dispensed with. The tobacco is thrown up either as an enema, or in the form of vapour; but the former method is generally preferred. A drachm of the leaves is infused in a pound of water for ten minutes, and one-half of the liquid injected; if this prove insufficient to prostrate the patient, the rest is administered after the lapse of a short interval. But many people have thus been poisoned, and the indiscriminate employment of the supposed remedy cannot be too strongly reprobated; its effects are most severe and unmanageable; the state of collapse is most complete and alarming, and it is often difficult, if not impossible, to bring the patient out of it — to procure reaction. In some cases reduction may be accomplished during the state of extreme debility which follows its use, but I have often seen it fail, and have witnessed the operation afterwards performed on the patients, who were at the time without pulsation, and from whom little blood flowed after the incisions; they never, of course, rallied, and sunk rapidly. Indeed the patient is always in a very unfavourable state for operation after the exhibition of the tobacco enema, though certainly in a very favourable state for reduction being attempted. The strong objection to the medicine I conceive to be its being so extremely unmanageable; it is impossible to say whether the depression of the vital powers that must ensue will be just sufficient to induce that relaxation and debility necessary or favourable to reduction, or whether it will proceed uncontrollable to such a degree as to extinguish life. In general it produces intolerable nausea and depression, universal relaxation of the muscles, coldness of the surface, with clammy exudation, vomiting, violent retching, vertigo, and perhaps insensibility. Were I so unfortunate as to be the subject of strangulated hernia, I should certainly have no tobacco used. After unsuccessful trial of the taxis, I might submit to be bled ad deliquium, and have a surgeon to attempt reduction during syncope; if somewhat more advanced in life, I should prefer the warm bath; if taxis then failed, I should certainly be operated on in a very few minutes afterwards. If the surgeon, after mature consideration, make up his mind as to the course of practice he would wish pursued in his own case, he will be fully alive to the necessity of impressing the utility of it on his patients, and have little difficulty in persuading them to submit to his proposals. No time should be dissipated in administering purges or clysters, or in cold or warm applications.

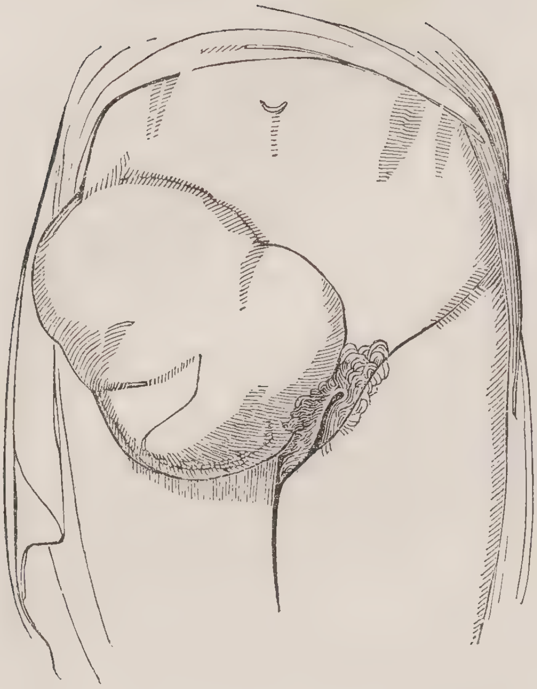
If the tumour is not very tender, make one good trial of the taxis, not long continued; if a warm bath can be readily commanded, place the patient in it, and employ the taxis when he begins to feel faint. If foiled, and if the patient can bear depletion well, the strangulation being recent, try a full bleeding to syncope; it may save depletion afterwards, and at all events the patient will be none the worse for it. Having failed, as may probably be the case, operate without delay.

The operation, as regards the immediate consequences, is neither formidable nor dangerous of itself; the delaying of it is attended with the most serious and irretrievable mischief. It ought to be performed within a very few hours after the occurrence of strangulation, and, in most instances, without putting off time with the means considered auxiliary to the taxis. Under urgent circumstances, it may be necessary to operate within a quarter of an hour after seeing the patient, as I have often done. In ordinary cases, time must be taken to converse with the patient and his friends, to convince them that all those means likely to assist reduction, and render an operation unnecessary, have been tried. The surgeon must not appear to be in a hurry, though he puts off no time unnecessarily; otherwise his motives may be misconstrued.

The necessity for operating early is greater in small than in large herniæ, in crural than in inguinal. The groin and neighbouring parts are to be shaved, and the patient placed in the recumbent posture, with the shoulders slightly elevated. The mode of operation must be varied according to the nature of the tumour, its size, and other circumstances.

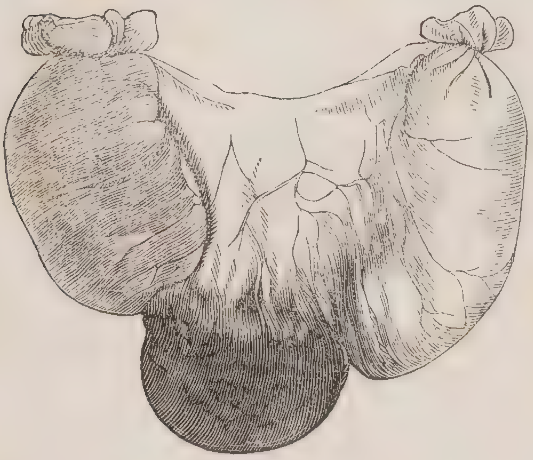
The operation for inguinal herniæ is conducted as follows: — The patient is placed recumbent on a table, or, in private practice, on the side of a bed, his shoulders supported by pillows, and his feet resting upon a stool. An incision is commenced about an inch above the external abdominal ring, and continued to the bottom of the tumour. This latter part of the procedure, however, is applicable only to small and moderately-sized herniæ; in large tumours the wound is not made so low, for in them the bowels may be irreducible, from the quantity protruded, and the contracted state of the abdominal cavity; in such cases the incision should be only to such an extent as is sufficient to enable the operator to reach the stricture. The first cut is carried through the skin and fatty matter, not deeper. The layers are then divided successively, with the hand unsupported; and this is done only at the middle and projecting part of the swelling. It is unnecessary to prolong the incision of the layers along the whole extent of the wound in the integuments, at this stage of the proceedings. In the direct hernia, which is of rare occurrence, there is but one proper layer, — that furnished by the superficial abdominal fascia: not unfrequently there is an imperfect additional envelope, furnished by fibres from the edge of the external ring; sometimes the tumour does not escape through the external ring, and is then of course covered by the tendon of the external oblique; of this I have seen but one instance, and that in a female; but in a common inguinal hernia there are three or four, and these are thickened more or less according to the size and duration of the tumour. The division of these layers must necessarily be conducted with great care and caution. At length the sac is exposed. This is opened by pinching up a portion betwixt the nails of the thumb and forefinger, or with dissecting forceps, and then cutting with the blade of the knife laid horizontally. On wounding the sac, there is usually evacuated a small quantity of brownish serous fluid. The probe-pointed bistoury is then taken up, and insinuated into the opening; and by this instrument, guided on the forefinger of the left hand, the sac and its coverings are divided up to near the ring, and down to near the bottom of the tumour. The hernial contents are thus exposed. These are unravelled, and examined attentively; if only brownish-red, from accumulation of the venous blood, of unbroken surface and unadherent, they are fit to be reduced. The stricture is felt for with the forefinger of the left hand, and into it either the point of the finger or the nail is gently insinuated. The protruded parts, if voluminous, are held down by an assistant; and along the forepart of the finger is passed a probe-pointed, narrow, and slightly curved knife. In carrying this upwards, the blade is placed flat on the finger, and its point, and no more, is passed through the contracted part; its edge is then turned forwards, its back resting on the finger; and by raising the handle gently, a slight incision is made into the more resisting fibres, in the direction of the mesial line. The instrument is withdrawn with the same caution as in its introduction. The finger now enters easily, and by raising it gently and repeatedly the parts are dilated. It is then passed upwards to the site of the internal ring: and if this be found narrow and contracted, the edge of the knife to be dirceted against it in a similar way, and dilatation to a sufficient extent effected. Now reduction is to be commenced, and in doing so the same precautions are to be observed as in the employment of the taxis. The hernial sac ought in the first place to be fixed by the fingers of the assistant placed in the bottom of it, so that it may be prevented from sliding up along with the contents. A neglect of this rule is often observed to lead to much embarrassment. The parts seem to have passed back into the general cavity; but on withdrawing the pressure they fall down again from the canal, along with the sac which had slipped up so far with them. In general, the omentum, if any, is put back first, and then the bowel; but this must depend on the relative quantity of the parts, and other circumstances. With the right hand the bowel is to be compressed as uniformly as possible; and, if at all obstinate, its reduction may perhaps be accelerated by pulling down a small portion at the neck, so as to facilitate the return of the fecal contents. By gentle pressure with the forefingers one portion is put back after another: it is wrong to attempt sudden and entire reduction; it should be gradual and successive. In many cases, from adhesion, or from the bulk and nature of the hernia, the parts, though sound, cannot or ought not to be reduced; a portion may be got back, but part requires to remain. This can often be ascertained beforehand by properly conducted and previous inquiry into the history of the case, as to the duration of the disease, and the period at which the whole tumour could be made to disappear. In such cases, the stricture should always be freely relieved. When the bowel is mortified, and its contents effused into the sac, care is to be taken not to detach or disturb the adhesions at the neck, and the bowel should be opened so as to allow of free discharge. When the bowel or omentum are comparatively sound, though irreducible, the surgeon must rest contented with relieving the stricture; then cover the parts with the integuments, and promote union of the wound. If it be considered necessary to remove condensed and tuberculated omentum, it is cut off, and separate ligatures of fine thread are applied to every bleeding vessel on the cut surface; the whole mass is not to be included in one noose, as was formerly the practice.

In the operation for femoral hernia, the position and preliminaries are the same as for inguinal. A longitudinal incision is made from above the margin of Poupart's ligament to a little below the middle and most prominent part of the tumour. This is crossed by another at its lower extremity, the whole resembling in figure the letter ⊥ inverted; and the two flaps so marked out, are reflected. Sometimes a single incision, from above the neck of the tumour to the lower border of it, is sufficient to afford room for the after proceedings. For some years past I have performed an incision along the course of the ligament of Poupart, with another falling from it over the body of the tumour like the letter T, with the transverse part a little awry. In cases of very large femoral hernia, such as that seen on the next page, the incisions, as in the large inguinal tumour, must be made over the



situation of the femoral ring, and to a limited extent. In this case the symptoms had existed for eight days, and had been latterly very urgent, there being profuse feculent vomiting, and great depression of the powers of life. There was a large mass of bowel protruded: this was all returned, and the patient, though well advanced in life, made a rapid recovery. A cast was obtained after her death, which happened several years afterwards. It is seldom indeed that femoral hernia attains such a size. I have seen it in the male, however, nearly one half the size of the swelling here shown. The tumour is often not larger than a walnut, seldom exceeding the size of a small apple. One layer is found covering the sac, furnished by the strong and dense cellular tissue which occupies the space under the crural arch and falciform process of the fascia lata: it is generally denominated the fascia propria, and has been described improperly, it would appear, as the sheath of the femoral bloodvessels; at the lower part of the tumour it is generally wanting. It is carefully divided, so as to expose the sac. This not unfrequently is thickened very considerably, a quantity of dense fatty matter being intimately incorporated with it; but in general it is thin, and appears of a dark colour, in consequence of the bowel and effused bloody serum being seen through it. It is opened with great caution, part of it being raised and touched with the edge of the knife held horizontally, or nearly so. The aperture, thus formed, is enlarged by means of the probe-pointed knife, which is carried upwards along the forefinger of the left hand. Some recommend that the sac should be left undivided, and that the stricture should be relieved by passing the knife on the outside; others, that only the neck of the sac should remain entire, and the stricture be attacked also on the outside of the peritoneum. But this appears an unnecessary and unprofitable precaution. The extreme difficulty of returning the sac is now well known and generally acknowledged; indeed, reduction of it, whether opened or not, is practicable only in recent cases. Its neck, besides, is firmly constricted; and the bowel may and will remain strangulated when returned along with its sac, for the peritoneum long retains the contraction at its strictured point. The stricture cannot be well relieved unless the neck of the sac is cut along with the resisting fibres exterior to it. After the sac has been opened, the forefinger of the left hand is passed up to the crural ring; and it should be recollected that this opening is very small, even in most cases in which a hernia of ordinary size has existed for some time. It is capable of great dilatation, gradual however, so that, in very old and large ruptures, it may admit two or three fingers easily. But in general only the nail of the finger can be insinuated into it; and this is a better and safer conductor for the knife than a grooved director. The edge of the stricture is felt very sharp; the point of the finger is turned towards the pubes, and along it a narrow, blunt-pointed, curved bistoury is passed in close contact, and with the edge towards the pubes; its mere point is pushed beyond, and then the position of the blade is changed: its back is turned upon the finger. This slight motion is of itself often sufficient to relieve the constriction on the protruded parts, and permit their reduction; if not, a few more fibres are cut by raising the handle of the knife gently from the palm of the hand. The direction of this incision is towards the tuberosity of the pubes, inwards and forwards. Thus only the crescentic portion of the crural arch is cut; and the division of this produces sufficient relaxation of the neighbouring parts. There is danger in cutting directly forwards, particularly in the male, at least if the incision be made to any considerable extent; there is a risk of wounding the spermatic chord, and the obturator artery has also been met with in a few instances coursing round the neck of the sac. This distribution of the artery, however, is rare, and can occur only when the epigastric and obturator arise by a long common trunk, and even then it may not encircle the neck of a hernia, as I have witnessed. Occasionally a vessel of considerable size passes round the opening, connecting the epigastric with the obturator, when these arteries follow their usual course; and this also may surround the neck of the sac. If vessels should exist in this situation in a person the subject of operation, as has not happened so far as I know, they would be felt by the finger used to conduct the knife. And the bistoury should never be passed — for there is no necessity for it — through the opening so far as to meet with a vessel, even if awkwardly placed. The danger of cutting forward and to any extent has already been spoken of; such incision can answer no good purpose. The stricture is not in Poupart's ligament — though at one time it was proposed to cut this through without interfering with the tumour at all — but in the crural arch underneath, and in a manner independent of the strong tendinous chord and expansion. The crural arch is formed by the junction of the fasciæ of the thigh and abdomen, superficial and deep. It is inserted into the linea ileo-pectinea, where the tendon of the external oblique has no connection, and is strengthened by fibres from the internal oblique, transverse, and recti muscles. The crural aperture formed by this arch is relaxed by flexion and inversion of the thigh, and by relaxation of the abdominal parietes. And this fact requires to be attended to, after operation as well as during the taxis, so as to facilitate replacement of the protruded parts.

The same attention to the state of the parts in judging of the propriety or not of reduction after operation, and the same after treatment, both general and local, is requisite in crural hernia as in inguinal. When the parts are reduced, the edges of the wound are brought together by means of a few stitches; a graduated compress, of proper dimensions, is applied, and retained by a spica bandage. If this is neglected, there is a risk of the parts again descending. Afterwards large mild enemata are to be administered, and, after some hours, purgatives, so as to procure copious and free evacuation of the bowels. In many cases after reduction, the bowels cannot by any means be got to act downwards. This seems sometimes to arise from a sort of paralytic state of the fibres of the part which has been extruded and compressed. Again, it often arises from an indentation of the coats of the bowel at the point where they have been tightly embraced and compressed by the sharp edge of the opening, as here represented. The engorged and dark state of the upper portion of bowel contrasts well with the lower, which is generally empty, contracted, and pale. If the stomach continue unsettled, a sinapism may be applied to the epigastrium, or solid opium exhibited. Subsequently it may be necessary to bleed locally, or generally, or both; in other cases the strength from the first requires support. After cicatrisation, a well adapted truss must be constantly worn.



Umbilical hernia is generally congenital. The tendinous parietes are often deficient to a great extent, and there is consequently much fulness along the umbilical chord. The plan of embracing such tumours in children by ligature, as at one time extensively practised, is now abandoned, there being much risk of peritoneal inflammation and fatal issue. The surgeon is now content with reducing the hernia, and applying a truss, to prevent displacement, as in other forms of protrusion; and if this be done in early life, and the apparatus carefully worn, the opening contracts, and the patient may ultimately be cured. The tumour may become strangulated, though rarely in the adult; it is generally large, and almost solely occurs in females. The sac has no covering but the skin and cellular tissue and fatty matter. A small incision is made through the sac and its investments, either on one side of the tumour, or in the mesial line at its lower aspect. The stricture is then divided with care, the parts reduced, the wound approximated, and a compress applied. Opening the tumour throughout its whole extent is hazardous and unnecessary. The same remarks apply to the proceedings in cases of ventral hernia. In corpulent females the tumour is sometimes scarcely prominent, and is only discovered as a flattened cake through the fatty matter.

The contents of hernia are often in a very bad state, either dark-coloured throughout, or studded with dark tender spots. Lymph is often effused all over the parts, gluing them to one another, and to the sac. This effusion, which generally takes place to the greatest extent at the neck of the sac, is a wise provision made by nature against the accidents of the disease; inasmuch as a barrier is thereby formed between the cavity of the abdomen and the extruded parts, preventing, in a great measure, the destruction of the latter from affecting the abdominal viscera. For example, a portion of protruded intestine sloughs, the feculent matter is effused, and, had not this adhesion to the neck existed, the gut might have slipped back into the abdomen, its contents would have escaped there, and a fatal result would have been the inevitable consequence. Still, notwithstanding the salutary effusion, the bowel may ulcerate at its upper part, and, giving way within the belly, produce rapid death. The bowel, where embraced by the stricture, is contracted and thickened, and dilated above. At the lower part of this dilatation the coats are apt to give way by ulceration, even after incision of the constricting parts and reduction. The contraction does not disappear quickly. In some cases it continues to such an extent as to keep up obstructions to the fecal matter, and cause a fatal issue from this cause alone, as noticed above.

Often, on opening the sac, in long neglected cases, a discharge takes place of fetid air and thin feculent matter, the bowel has mortified either entirely or in patches; in the latter case, presenting the appearance of having been perforated at various points. Few constitutions can bear up under such mischief. In some, if an opening be not made, the integuments slough, and the patient, rallying after discharge from the bowel takes place, recovers after losing a portion of integument, of intestine, and perhaps of omentum. In others, and they constitute the majority, the system sinks, before discharge from the bowel is effected, by sloughing of the external parts.

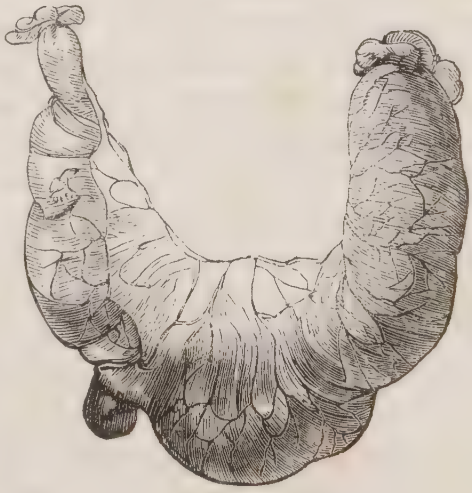
The surgeon is called on to operate in the worst possible circumstances, provided the patient is not in articulo mortis. Even after many days of feculent vomiting the bowels may be found tolerably healthy. The sac must be opened carefully, and the stricture is to be relieved without disturbing the adhesions that have formed. The bowel, when dead, or evidently gangrenous, is to be opened, and the discharge of feces by the wound promoted. If returned into the abdomen, the sloughs will separate, in all probability, and feculent effusion take place, causing death in a very few hours. Sometimes the patient lingers longer than could be expected, and I have known a female survive upwards of a hundred hours after the occurrence of effusion into the abdomen, from the giving way of an ulcer in the stomach. The dressing should be light, and the patient's strength must be supported in every way, by the mouth, and by the anus when the injured part is high in the canal. The separation of the sloughs is to be encouraged. The extent of sloughing need not dishearten the surgeon, for large portions of bowel, several feet in length, have mortified, and the patients recovered, with artificial anus, either temporary or for life.

In artificial anus, when this has followed upon destruction of the bowel to a considerable extent, the intestine has contracted firm adhesion to the hernial sac at the opening in the abdominal parietes; through the opening in the bowel exterior to this the feculent matter is discharged externally, and by the adhesion is prevented from being effused into the abdominal cavity. The protruded bowel in which the sphacelation has occurred may be said to be thereby divided into an upper and an under portion, — one, the upper, discharging, the other, collapsed and empty; these lie parallel to each other, in close contact, and usually adhering, from the abdominal or crural ring downwards, to each other, and to the hernial sac. The hernial sac seldom sloughs entirely; in almost every case its neck remains sound; to this remaining part the intestine adheres. The deficiency in the integuments and cellular tissue, through which the feculent matter escapes, gradually contracts, and the aperture in that portion of the hernial sac which is exterior to the intestine also diminishes; but at the same time dilatation takes place in the immediate vicinity of the intestinal orifices, so that a funnel-like cavity is formed for the evacuation of feces, extending from the opening in the bowel to the opening in the skin — its narrowest part being at the latter situation, its most capacious surrounding the intestine. The cellular tissue intermediate between the integument and hernial sac becomes condensed, and forms a membranous lining. By this cavity an imperfect communication is established between the two portions of bowel, part of the feculent matter returning through the lower intestinal orifice, and part escaping externally. But this communication must be indeed very imperfect at first, since the two portions of bowel lie parallel to each other, and their coalescing sides form an acute angular projection into this funnel-shaped cavity. The lower portion is necessarily much diminished in calibre, being in a great measure unaccustomed to the usual distension, and its collapsed orifice is retracted a little higher than that of the superior. On account of these circumstances feculent matter cannot pass straight onwards from one portion of bowel to the other, but must first traverse the funnel-shaped cavity; and even then it is but a small quantity that reaches the rectum. Indeed, in most cases of artificial anus, nothing but occasional flatus passes by the original outlet for weeks or months. After some time the bowel retracts, but cannot leave the adhesion in the groin: by this retraction the orifices may be brought in a more direct line with each other, and the natural passage of the feces be somewhat assisted.

When one or more slight patches of discoloration are observed after division of the sac, it may be returned, it being most probable that the parts will recover after removal of the stricture. When any portion has given way, of course no one can contemplate reduction; and when the whole calibre has sloughed it is absurd to attempt separation of the adhesions which must exist, dividing the external from the internal parts.

In mortification of a protruded knuckle, or part only of the calibre of bowel, the symptoms are at first severe. These are vomiting, pain, and symptoms of enteritis; perhaps the bowels are obstructed for some time, but evacuation again takes place, as happened in the following remarkable and instructive case. A gentleman, nearly eighty years of age, was, during the action of medicine, suddenly seized with pain in the groin. A very small tumour was observed—

he became sick—and when I visited him for the first time two days after, he had no further evacuations from the bowels, he vomited constantly bilious fetid matter, and he began to complain of pain in the abdomen. Pressure was kept upon the tumour, which protruded at the crural aperture, for some time, with the effect of diminishing its size very considerably. On returning in a couple of hours with Sir B. Brodie, with the intention of cutting down upon the swelling, the bowels had been freely relieved, the vomiting had entirely ceased, and there was not the slightest vestige of tumour to be perceived or felt, on the most attentive examination. The patient had a good night, but in the morning had a recurrence of the symptoms: these continued, and a fatal termination shortly occurred; still no tumour could be detected before or after death. It was supposed that the obstruction might have been caused by a continuance of the constriction of the bowel, where it had been nipped by the stricture. On a post-mortem examination, there was found an exceedingly small portion of the coat of the bowel still entangled in the crural ring, whilst a larger portion, which bore marks of having been protruded, was thus entangled, and confined to the spot. The bowel, though not completely obstructed, was narrowed by the confinement of part of its parietes.



Abscess often occurs externally to a small swelling of this nature, and on the giving way of the integument, matter, flatus, and thin feces are discharged. A *fecal fistula* remains for some time; but, by the aid of lymph and granulations, the breach in the parietes of the bowel is repaired gradually, the feces resume their natural course, and the external opening heals.

When the whole calibre has sloughed, and even when a large extent of bowel has come away, and there is still a chance of the patient recovering from the artificial anus by natural means, after the lapse of many months. As already remarked, the intestinal orifices retract, and come more into a straight line. A mucous discharge occurs from the lower bowels along with the passage of flatus, and at last part of the feces is voided by the rectum. The discharge from the external opening diminishes, and ultimately ceases, perhaps only a minute fistula remaining, through which a few drops of fluid, sometimes feculent, sometimes limpid, may occasionally escape. The funnel-shaped cavity previously contracts into a narrow fistula. This desirable result may be assisted and hastened by gentle pressure; and, after the feculent discharge has nearly ceased from the fistulous opening, the healing of this may be accelerated by the cautery lightly applied. It has been proposed to destroy the projecting septum between the two portions of bowel, either by ligature or by the pressure of forceps; but this should not be attempted unless nature seems unable to effect a cure. The former method consists in including a considerable part of the septum in ligature, so as to induce condensation of the parts by effusion of lymph, and destruction of the projecting portion. This has not been found very successful. The application of forceps presents a more rational expectation of cure. The external opening is dilated, and the situation of the septum ascertained. One blade of metallic forceps, with blunt serrated edges, — Dupuytren's, — is passed into the one intestinal orifice, and the other into the opposite; the handles of the instrument are then approximated, locked, and fastened with a screw, and by means of the last-mentioned part of the apparatus the degree of pressure is regulated. Pain of the abdomen, furred tongue, loss of appetite, sickness, vomiting, and constitutional irritation, generally follow this proceeding, but gradually subside on the employment of enemata and fomentations, and on lessening the pressure of the forceps. The septum cannot long withstand the continued compression, and by its destruction the chance of cure is greatly augmented. The proceeding is, besides, not so dangerous as might at first be supposed; for effusion of lymph takes place to a considerable extent above the part grasped by the forceps, gluing the portions of bowel firmly to each other, and forming a new barrier against any of the feculent matter escaping inwardly. Attempts may be made to repair the loss of substance in the skin by paring the edges of the opening, and affixing a flap taken from the neighbourhood.*

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* [In a case of artificial anus which came under the notice of the late Dr. Physick, in 1808, relief was afforded by the following procedure. A crooked needle, armed with a ligature, was passed from one portion of the intestine to the other through the contiguous sides, about one inch within their orifices. The ends of the ligature were then tied with moderate firmness at the external aperture, where they were left protruding. In this situation it gradually made its way through the parts which it embraced by ulcerative action, at the same time that it produced strong adhesion between the two folds of the bowel. After several weeks had elapsed, Dr. Physick divided with a bistoury all the parts which now remained included within the noose of the ligature, thus establishing a direct communication between the upper and lower extremities of the gut.

Dr. Lotz, of Pennsylvania, succeeded a few years ago in curing a case of a similar kind, by means of an instrument which possesses some advantages over that of Dupuytren, and an account of which is published in the eighteenth volume of the *American Journal of the Medical Sciences*. It is composed of two blades, each six inches long, which are worked by two screws, and which terminate in front in two fenestrated branches, twelve lines in length by three in width. One blade being inserted into each extremity of the gut, they are carefully adjusted by tightening the screws, and are thus made to compress the intervening membranes. The pressure may be increased or diminished at pleasure. In the case treated by Dr. Lotz, the portion of the bowel corresponding with the fenestræ was excised with a gum-lancet on the fourth day from the application of the instrument, and in this manner a direct passage was created between the two ends of the tube. — Ed.]

There is a greater chance of recovery from the inconvenience of artificial anus after hernia than after wounds. If the opening in the bowel be near the stomach, the patient will die from inanition. When it is lower in the intestinal tube, nutrition is more perfect, and the patient can be further supported by nutritive enemata. When no natural cure is likely to take place, the inconvenience will be palliated by a truss with a soft pad being worn, so as to retain the feces till a favourable opportunity occurs for evacuation; or a soft plug of lint may be inserted into the aperture, and retained by a compress and roller. Prolapsus of the mucous membrane of the gut sometimes takes place through the artificial anus, and is reduced with difficulty. The use of a truss or tent, already mentioned, will tend to prevent the occurrence. Great attention to cleanliness is required when the opening cannot be closed.

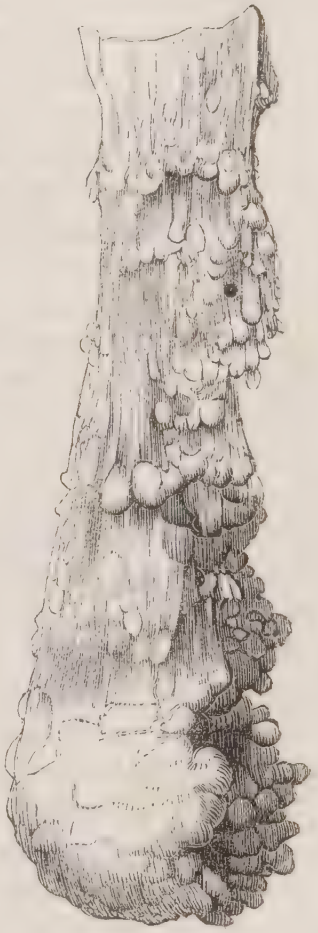
Operations for other kinds of hernia, if discovered during life, are to be conducted on similar principles with those for inguinal and crural. The surgeon must be guided by his anatomical knowledge. No positive rules can be given.

In *Ascites*, or accumulation of fluid in the peritoneal cavity, the surgeon is not unfrequently called upon to relieve the patient, when the abdominal parietes are much distended, and the functions of the viscera of the abdomen and thorax interrupted. He must, however, exercise his own judgment in regard to the case, and convince himself of the propriety of operating. He must examine into the symptoms, and ascertain that the tumour is really caused by accumulation of fluid in the bag of the peritoneum. In ascites, the abdomen has swelled slowly and uniformly, and distinct fluctuation is felt when the hand is placed on one side of the swelling, and gentle tapping made at the other. There is considerable difficulty of breathing, uneasiness in the abdomen, usually increased by pressure, thirst, and scanty secretion of urine. It ought to be remembered that other affections have been confounded with ascites, and lamentable operative mistakes committed in consequence. Trocars have been thrust into the belly for tympanitis, either of the bowels or of the peritoneum — for solid tumours of the viscera — for enlargement of the ovaria.

As already hinted, the operation of tapping the abdomen is to be undertaken only when the distention is very great, when the functions of the thoracic and abdominal viscera are interfered with, and when diuretics, and other means of getting rid of the fluid, have failed to diminish the accumulation. The trocar employed is either flat, with a spring steel canula, or round; when the latter is used, and the abdominal parietes are not very tense, a small incision is first made with a lancet or bistoury; a large trocar with blunted edges and point can then be readily and safely introduced; the flat one enters easily, and requires no previous wound, but does not permit so rapid and free a flow. The point usually chosen for the puncture is either in the linea alba, a little below the umbilicus, the bladder being previously emptied, — a precaution which should always be attended to, though in general there is little danger of wounding this organ — or midway betwixt the superior anterior spinous process of the ilium and the umbilicus, with the view of penetrating the parietes in the linea semilunaris. The latter situation, however, can seldom be obtained with accuracy, for the parietes yield irregularly. Little bleeding follows the puncture at either point; but the risk of hemorrhage is greater at the latter, for branches of the circumflex artery may be wounded. More serious bleeding is liable to occur, from the veins ramifying on the abdominal viscera giving way, on removal of their support, as the serum flows off. Fainting, also, may take place from accumulation in the branches of the vena portarum, unless the fluid is withdrawn slowly, and the precaution adopted of supporting the parietes with a broad band both during and after evacuation. Bandages are made for this purpose, with tapes and straps attached, and are well fitted for it. Three or four yards of flannel, however, with each end split, are equally effectual, and can always be readily obtained — a consideration of consequence in the choice of all apparatus. After the band has been applied, a person is placed on each side to tighten it gradually by steady pulling at the ends, which are carefully crossed behind. An opening is made in the cloth, opposite to where it is proposed to puncture, and the operation is then proceeded in. Sometimes the flow is impeded by the omentum or a fold of bowel falling forward on the canula, and closing or diminishing the opening; this is remedied by passing a tube along the canula, closed at the extremity, but perforated at the sides near it, and about half an inch longer than the canula. After the cavity has been emptied, the patient is placed recumbent, and a long broad flannel bandage applied over the whole abdomen, and retained, so as to prevent shifting, by straps passed over the shoulders and under the perineum.

Collections occur in the *ovaria.* The fluid is generally glairy, sometimes thick and gelatinous, often turbid and dark coloured. Not unfrequently the main cyst is subdivided, either by membranous septa, or by an aggregation of smaller cysts of the nature of hydatids. The swelling is at first on one side, and gradually rises out of the pelvis; often it remains long moveable; it increases, becomes more fixed, and ultimately fills the abdomen, displacing the viscera, and giving rise to feelings of much uneasiness, deformity, and loss of health. The cyst is generally thick; sometimes it is thin at one or more points, and this may give way, causing effusion of the contents into the peritoneal sac. Fluctuation is perceptible in many cases; in others it is obscured by the thickness of the cyst and viscidity of its contents. Many such swellings may be punctured both with advantage and with safety, but generally the tapping requires frequent repetition. Some patients require tapping, merely as a mean of improving the figure and relieving uneasy feelings, once, twice, or thrice a year; their existence is not much embittered or abridged by the disease. A large round trocar is necessary for the purpose; and the puncture is made at the softest and most prominent point of the tumour, a small incision through the integument being premised.

The ovaria become enlarged by degeneration of their structure and the addition of solid matter in great abundance. The consistence and structure of such tumours are very various; they are sometimes, though rarely, medullary, often fibrous, with or without cysts, sometimes melanotic. In the majority there are cysts, varying in size, number, and contents; sometimes the bag contains hydatids, or it is filled with curdy matter, sometimes with glairy colourless fluid, sometimes with a turbid and flaky serum, sometimes with blood; and in them, as well as in the enlargement from accumulated fluid, though perhaps more rarely, are occasionally found teeth, hair, and membranous looking matter; some are intermixed with bone, cartilage, and fat. The situation and attachments of such tumours cannot be correctly ascertained by examination during life, far less can their internal structure and dispositions be arrived at. Indeed an accurate diagnosis is exceedingly difficult, if not impossible. Innumerable mistakes have been made, which have led to most unjustifiable proceedings. In one case, the abdomen was, after two or three dry tappings, opened by an incision from the ensiform cartilage to the pubes; the viscera were turned over and over, but no tumour could be discovered. The woman was sewed up, and did not die. The following was a still more complete failure in diagnosis. In a case of large tumour of the belly, many persons accustomed to manipulate abdominal swellings considered that extra-uterine conception had taken place; and that the child had come to maturity and perished. The history of the case countenanced the supposition; the symptoms had been such as indicate impregnation. The woman, to avoid exposure, went to a distance to be relieved of her burden, which was becoming more and more troublesome and bulky. The usual period passed over. It was thought that the head and thorax of an infant could then be felt readily through the parietes, and perhaps some one might have been found heroic enough to have divided them and explored the tumour. The young woman, however, was in the last stage of phthisis, and soon died. A wonderfully tuberculated omentum, a very small portion of which is here represented, filled the peritoneal cavity; the uterus and its appendages were quite healthy.



Operation has also been proposed, when, on dissection, the liver was found to compose the abdominal swelling. Such cases, a long list of which might be given, render the prudent surgeon very cautious in his diagnosis of abdominal tumours, and chary of operative interference with them. The abdomen has been opened, as already stated, and the result has been such as to render the perpetrator indictable for culpable homicide, and to qualify him for such punishment as his rash and reckless conduct richly deserved. A less severe censure might have sufficed, had not the example been followed by similar proceedings, and equally direful results; and these have been such as to render any condemnatory remarks not only justifiable but absolutely necessary. A great many unfortunate women have, I am afraid, been sacrificed to a desire for false reputation. The attempts to remove abdominal tumours by incision of the parietes were some time ago very numerous; and, as might have been expected, the issues were highly unsatisfactory to those concerned. Such doings, however, were recorded in print, represented in plates, and moreover puffed and placarded ad nauseam. The majority of those who were thus "dissected, to see what part was disaffected," perished within forty-eight hours. One woman survived for some time, after having been subjected to this *operation*, improperly so termed. In her there was a tumour, but of such a size, and so connected, that it could not be removed. A second survived the extirpation of one ovarium; and the other, also diseased, was left for a further exhibition of daring intrepidity. It is not easy to conceive how the proposal could have been seriously entertained by any sane individual, far less put in practice and persevered in, when disaster after disaster crowned every attempt. It is my opinion, and I believe that I express the sentiments of a very large portion of the profession, that the repetition of any such incisions and gropings would be unpardonable.—1. On account of the difficulty, nay, impossibility, of forming a correct diagnosis; of ascertaining with certainty what organ is involved; of ascertaining the structure and disposition of the tumour, if any, and to what parts it is adherent. 2. Because the ovarian disease, in general, even though extensive, does not threaten imminently a fatal termination, being slow in its progress, and the greater number of the swellings being not of a malignant nature. The solid tumours are sometimes of a bad kind, as already stated; but enlargement by fluid is much more frequent in the ovaria than that by solid and new matter. 3. If the tumour be malignant, it will be impossible to ascertain to what extent the parts are involved by the diseased action, or whether the lymphatics are affected or not. There is a strong probability of the lymphatic system being involved, even at a very early period; and then the extirpation of the tumour—supposing the mass to be so situated as to admit of removal without difficulty or danger—cannot be attended with any advantage; in every point of view, therefore, interference is unadvisable. 4. The operative attempt is attended with imminent danger. There is almost a certainty of the patient being almost instantly destroyed by it, as shown by the sad experience of the past. "We are not the arbiters of life and death of those who apply to us for relief. If people die in consequence of disease, it cannot be helped. They submit to it because they know it is inevitable. But we had better refrain from making such experiments as may probably destroy them, and bring disgrace upon the profession."

Bruises of the abdomen are apt to be followed by inflammation of the contained parts, particularly of the serous membrane. Occasionally lacerations of the viscera, both solid and floating, but more frequently of the former, are produced by bruising or squeezing of the abdomen, as by a blow, or by a heavy body passing over; they may also follow a violent concussion of the parts by falling from a height. The liver is the organ most frequently torn, and death is commonly the result, rapid, and principally from hemorrhage. The laceration is generally on the convex surface; extravasation takes place under the peritoneal covering; or this is torn, and the effusion is into the abdominal cavity. When the quantity of blood is not so great as to cause speedy dissolution, the patient may survive for some time, and even ultimately recover. Reaction is slow, the patient continuing a long time pale, exhausted, and almost pulseless; there is tenderness in the hypogastric region, with swelling. The spleen is liable to similar injury, and pours out a large quantity of blood.

The gall-gladder has sometimes been torn, as also portions of the small intestines, by a blow or kick, or by a heavy body passing over the abdomen, as the wheel of a loaded wagon. The escape of the contents is followed by sickness, rigour, quick, weak, and indistinct pulse, most excruciating pain, a sense of heat diffused all over the abdomen, and rapid sinking of the powers of life; a fatal termination generally occurs within twelve hours. The same train of symptoms supervene when the contents of the intestinal canal have been effused into the peritoneal cavity, through an opening in the stomach or bowel, caused either by slow destruction of the coats, the peritoneum giving way last, or by a rapid ulceration or sloughing process, as in hernia. The patient may live in agony for a day or two, but death generally takes place much within twenty-four hours. The same may be said of the rupture of the bladder, from external violence, with effusion of urine into the peritoneal sac. No treatment is of any avail; venesection hastens the sinking. Fomentation over the abdomen, and sedatives either by the mouth or by the anus, soothe the patient, and render his last moments more calm.

Penetrating wounds of the peritoneal cavity, if they reach the solid viscera and large vessels connected with them, are attended with effusion of blood externally and internally, in quantities proportioned to the size of the external aperture, the importance of the vessels concerned, and the vascularity of the part. The patient may perish from the bleeding, either instantly or after some time; or inflammation and its consequences supervene in the violent form, and destroy him at a more remote period. The mere opening of the peritoneal cavity, and to a very slight extent, without the slightest injury of the contained parts, is often attended with a great shock to the system, and is followed by inflammatory action, which may run on to a fatal issue, in spite of the most active and judicious management. The inflammatory symptoms are to be combated by free abstraction of blood; in short, the utmost endeavours must be made to keep the action within bounds. When the intestines are wounded, the injured part may protrude; or the relative size of the openings through the parietes and bowel may be such, that the intestinal contents do not escape into the peritoneal bag. A natural cure sometimes takes place by adhesion of the surface of the bowel to the lining of the parietes round the wound, feculent matter continuing to be discharged externally ; after a time the opening may contract, and the discharge diminish and ultimately cease ; or an artificial anus may be permanently established, and this is not so easily cured as that following upon hernia. Wounds of the intestines, whether transverse or longitudinal, attended with feculent escape into the peritoneal cavity, are not uniformly fatal. Effusion of lymph takes place around, gluing the wounded bowel to the peritoneal surface of a neighbouring fold, or forming a sort of pouch within which the extravasation is limited. The treatment consists in absolute rest, and most rigid antiphlogistic regimen ; manual interference with the wounded part is not generally advisable.*

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* [When the wounded bowel protrudes, the aperture, unless it be very small, should be closed either with the continued or the interrupted suture, and then returned within the abdomen. This procedure is far preferable to the mechanical contrivances recommended by Reybart, Denans, and other surgeons ; or even to the more ingenious but almost impracticable method of stitching the intestine, proposed by Mons. Lembert of Paris. From some experiments, upwards of forty in number, which I performed upon dogs last summer with a view of more fully elucidating the subject under consideration, I am led to infer that it does not matter what kind of suture be employed, provided we use the precaution of closing the opening so completely as to prevent the escape of fecal substance. This is undoubtedly the grand principle which should regulate the conduct of the surgeon in the treatment of injuries of this nature. Let him guard against fecal effusion, and the patient will be comparatively safe, or free from the danger of peritoneal inflammation. To attain this object the continued, or glover's suture as it is termed, is unquestionably preferable to any other, especially when made, as I would suggest it should be, with a small sewing-needle, armed with fine silk, and passed between the muscular and mucous coats, or, what is the same thing, through the substance of the cellulo-fibrous lamella. After the suture has been applied, the protruded part of the mucous lining, if there be any, should be pared off with a sharp knife, to facilitate the process of reparation, the surface of the bowel should be cleansed with tepid water, and the whole carefully returned into the abdomen. If the interrupted suture be used, the intervals between each two respective threads must not exceed two lines, or the sixth of an inch, otherwise there will be danger of fecal extravasation, and the ends, instead of being brought out at the external aperture, should be cut off close to the knots. The reason why I prefer the continued suture, made in the manner above mentioned, is simply because we can thereby more effectually close the wound, at the same time that the parts are placed in the best possible condition for speedy reunion, from the want of protrusion of the lining membrane, and consequently the more perfect contact of the serous surfaces.

The ligatures which are employed in sewing up a wounded intestine are detached at a period varying from ten days to three or four weeks, according to the nature of the suture. When the extremities

Lumbar Abscess is generally chronic; the collection of matter is gradual and slow. Sometimes it is acute, and rather rapid in its ap-

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are cut off close to the knots, they invariably fall into the cavity of the bowel, and are finally discharged along with the feces; if, on the other hand, they are brought out at the external opening, they pass off in that direction instead of the one just mentioned.

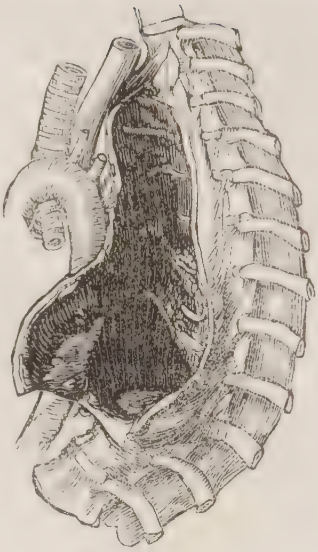
When the opening in the gut is small, not exceeding three or four lines in extent, the margins may sometimes be advantageously encircled with a ligature, with the ends cut off close to the peritoneal surface. Sir Astley Cooper tied up an aperture in this manner in the human subject, in a case of strangulated hernia, and the patient recovered without a bad symptom. Professor Gibson, of the University of Pennsylvania, states that he has performed a similar operation with similar results. My experiments on dogs convince me that the plan is a good one. The ligature should be drawn pretty firmly, to prevent it from slipping, and the ends must be cut off close to the knot. It generally makes its way into the bowel in from eight to ten days.

When the bowel is completely severed, or mortified in its entire calibre, the edges, after being properly prepared, should be brought in contact, and retained by the continued or the interrupted suture. Cases of this kind, although apparently desperate, are not always of so hopeless a character as might at first sight be supposed. This is shown, not only by experiments on the inferior animals, but by what occurs in the human subject, in sphacelated hernia, and in intussusception. In the former, the greater part, or even the whole, of the circumference of the tube may be destroyed, and yet the patient ultimately recover, with perhaps the temporary inconvenience merely of an artificial anus; and in the latter, large pieces are not unfrequently detached without any serious suffering, save what is experienced during the antecedent and concomitant inflammation. In my morbid collection is a preparation of this kind, evidently a portion of the colon, nearly a foot long, which was discharged by a child six years old, who, notwithstanding, made a speedy and perfect recovery. Thirty-five cases of a similar character, collected from the writings of different pathologists, have been reported by Dr. Thompson of Europe.[a] In a dog, from which I removed two inches and a half of the ileum, and treated the edges of the wound with six interrupted sutures, complete recovery took place, unattended with a single bad symptom. The threads were introduced at equal distances from each other, with a small sewing-needle, and the ends cut off close to the knots. Four months after the operation, being in good health, and the outer wound entirely healed, he was killed. Externally the bowel was perfectly smooth and natural, as if no injury had ever been inflicted upon it: the mucous membrane was of the same appearance as elsewhere, with the exception of a small depression corresponding with the edges of the wound. — Ed.]

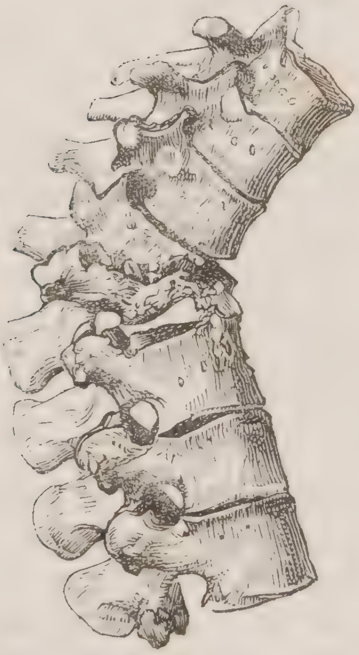
[a] See the Editor's Elements of Path. Anatomy, vol. ii., p. 260.

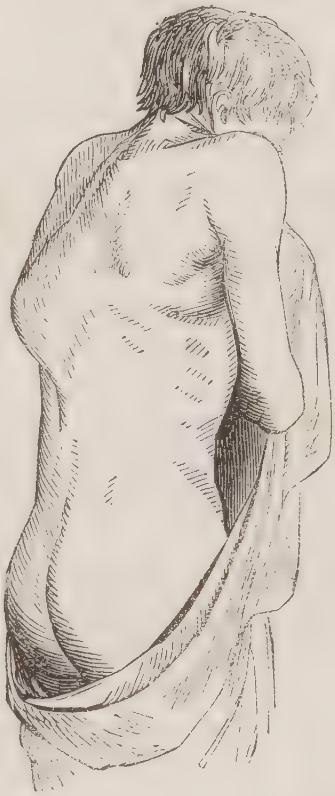
pearance. It may originate in the sheath either of the psoas or of the iliacus muscle; more frequently it seems to form behind these, and is connected with diseased bone. The precursory symptoms are often not particularly attended to; these are rigors and pain of the loins. As the disease advances, the patient feels great pain in the erect position, and in general the pain is aggravated by extending the thigh. Thickening and slight glandular enlargement takes place in the groin; there is an evident fulness there; and then swelling appears on the inner side of the femoral vessels, beneath the pubal portion of the fascia lata. This swelling is more prominent in the erect position, and is also increased by exertion of the abdominal muscles; an impulse is given to it on coughing. As it advances, and comes more to the surface, fluctuation is perceived. This is the most common site in which the abscess presents itself; but it is not unfrequently met with on the outside of the vessels, either lower or higher in the thigh, above Poupart's ligament, in the loins over the crest of the ilium, and occasionally the matter is insinuated under the pelvic fascia and appears by the side of the anus. Large and neglected collections may work their way to the surface in two or three of these situations at the same time.

The disease is often attributable to a sprain or wrench of the loins, or to exposure to cold and over-fatigue. Occasionally the mischief is confined entirely to the soft parts; the vertebræ, a portion of the os innominatum, or the sacrum, may be denuded and of irregular surface, but this is evidently the result of the pressure of the abscess. A striking example of this, and of the extensive destruction of parts which this affection sometimes produces, may be shortly stated. — A very large lumbar abscess formed within a few weeks, in consequence of great and continued fatigue and exposure to bad weather. At first it had been trifled with. At last it was opened in the usual situation in the thigh, and a vast quantity of matter evacuated. Thirty-six hours afterwards, the patient was suddenly suffocated by a flow of purulent matter into and through the air passages. On dissection, the cavity of the abscess was found to be immense, opening through the diaphragm into the lung which was adherent, and communicating with the bronchi. The forepart of the lumbar vertebræ was exposed, and in some parts stripped of the theca; but there were no cavities in the bone, and no disease of the interposed cartilages. Such cases are now and then met with, of abscess in the loins not originating in any vice either of the bones or of any other part of the apparatus of the spinal column. Most frequently, however, the collections have their foundation in ulceration of the bodies of the vertebræ. The patient has had tenderness in the part, weakness of the back and of the lower limbs, and increase of pain on pressing or striking some particular spinous processes — perhaps slight excurvation. Then pain in extending the thigh supervenes, followed by swelling and other signs of abscess. This is preceded generally by deposit of tubercular matter in their cancellated texture. Sometimes the disease seems to originate in the ligaments and articulating surfaces; occasionally portions of



the bone perish, and are found lying in the cavity of the abscess, as seen in this specimen, taken from a young subject. When the bodies of the vertebræ are attacked by ulcerative absorption, and sometimes the disease is very extensive, involving perhaps four, five, or six of the bones, there is more or less curvature of the spine outwardly — excurvation. If the disease affects one or two bones, and their bodies are almost destroyed, then the projection is sharp and angular. When the disease is more extensive the curve is greater, and more gradual ulceration sometimes exists to a considerable extent in one articulation, without change of form externally in the spinal column, and sometimes without any great collection of pus. When curvature commences there is very generally more or less weakness of the limbs, though curvature, whether from ulceration or interstitial absorption, is by no means of necessity attended by any degree of paralysis. The power of motion of parts supplied by nerves in the neighbourhood of disease is diminished earlier in general than the sensation, in consequence, possibly, of the mischief commencing in the anterior part of the bodies of the vertebræ. It is wonderful to what extent disease may extend in the vertebral column, without much impairment of the functions of the spinal chord, and how perfectly the functions are restored in cases where it has suffered. The lumbar vertebræ are those most fre-





quently affected, but the ulceration may also be either in the dorsal region or in the pelvis. Disease of the last lumbar vertebra at its connection with the sacrum, or disease of the sacrum itself, is attended with abscess around, which descends into the pelvis, displacing the bowel, and appearing by the side of the buttock.

Such abscesses may have been allowed to come to the surface, and to discharge their contents spontaneously; or they may have been at a late period opened either at one point or at several. In these circumstances, the discharge is generally profuse, long-continued, and attended with exhaustion and hectic, gradually but surely destroying the patient. But, by good management, a perfect and permanent recovery may in many cases be obtained. When the vertebræ are affected, absolute rest must be enjoined and enforced; and a drain is to be established by the sides of the spinous processes, either by moxa, potass, or seton — it is immaterial which. The discharge is kept up by occasionally dressing the issue for a few hours with an acrid ointment, so as to reproduce a slough. When the abscess begins to present, it should be opened as early as possible, and a free exit allowed to the matter; the discharge should be at no time confined. The opening of the cavity, and again shutting it up, however carefully conducted, is in almost every instance followed by alarming and hazardous results. Rapid accumulation of putrid and bloody matter takes place, and air is extricated within the cavity; the vessels of the cyst, being unsupported, part with their contents; irritative fever is lighted up, with rapid pulse, anxious countenance, and delirium. These symptoms are relieved only by immediate evacuation of the fluid. Some slight constitutional disturbance follows the making of a free opening, but quickly subsides; then the discharge improves in quality, becomes more pure and unmixed, diminishes in quantity, and gradually ceases. During the discharge the strength requires support; and the attention to the original mischief must not be neglected or intermitted.

Spina Bifida is a congenital fluctuating tumour, with deficiency of the subjacent vertebræ. It is usually situated in the lumbar region, sometimes in the dorsal, and often over the sacrum. The size of the swelling varies according to the age of the child, and the extent of deficiency in the parietes of the spinal canal. The spinous processes are either imperfect or altogether wanting, and over the space so formed the tumour is situated. Its contents are usually of a serous character, thin and colourless; sometimes they are turbid and flaky. The parietes seem to be a continuation, or protrusion, of the membranes of the spinal chord, thickened and somewhat altered in structure, and usually in close contact with and adherent to the integuments. By pressure the size of the tumour is diminished; but, if firm or long continued, unpleasant effects are apt to result. There is often debility of the lower limbs, and the disease is not unfrequently coexistent with hydrocephalus. Children with this affection seldom live more than a few years.

The application of gentle, uniform, and continued pressure affords support to the parts, and prevents increase of the tumour; and, under this palliative treatment, life may be both rendered more comfortable and prolonged. It has been proposed to combine continued pressure with occasional puncturing of the cyst by means of a fine needle, with the view of diminishing the tumour and ultimately obtaining entire obliteration of the cyst. The practice has been made trial of, and the result may warrant repetition; caution, however, is necessary, for the too free opening of the tumour is often followed by a rapidly fatal issue. A case occurred to me not long since, in which the tumour, of large size, was situated over the sacrum. The fluid was evacuated by a small trocar and canula, the parietes shrank, and a very satisfactory cure resulted.

AFFECTIONS OF THE RECTUM AND NEIGHBOURING PARTS.

Of Hemorrhoids or Piles.—Piles are blind, furnishing no discharge, except a mucous or puriform fluid; or open, pouring out a greater or less quantity of blood from time to time. They are usually of small size, invested by the mucous membrane, thickened, congested, and consequently of a dark colour; and either within the sphincter or projecting externally. Internally, they may sometimes consist of blood, coagulated or not, effused between the mucous and muscular coats of the intestine; but in general their inner structure is venous, at least in the first instance. Branches of the hemorrhoidal veins, ramifying near the inner surface of the gut, become varicose, probably from their superior trunks being compressed by hardened feculent matter or other obstructions. The varix protrudes the superimposed mucous membrane; and at first the excrescence is composed of the dilated venous trunks containing fluid blood, and invested by the membrane, which inflames, thickens, loses its villous character, and discharges a vitiated secretion. In this stage the tumour is easily compressible, and by pressure may be made to disappear almost entirely, the communications between the varicose vessels and the trunks above being still unobstructed. But inflammatory action is soon kindled in the incommoded venous branches, as frequently happens in varix of the lower extremities; their coats become changed, are thickened, effuse lymph externally and internally, adhere to one another, and are ultimately matted into one confused and solid mass; the contained blood coagulates, becomes fibrinous, the whole tumour feels hard and firm, and often is exceedingly painful. At length all traces of venous structure disappear; the tumour seems to consist chiefly of effused lymph, condensed cellular tissue, and coagula.

In not a few instances, however, the contents of the veins remain partially fluid, and a communication exists between the vessels of the tumour and those of the surrounding parts.

That such is the usual structure of piles I am convinced, from repeated and careful dissection of the tumours.*

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* [From my own observations and dissections I have long been convinced that there are two distinct and well marked varieties of hemorrhoidal tumours; one of which essentially consists in an en-

The neighbouring parts often swell and inflame. Sometimes one or two tumours only exist; or they occur in numbers, clustered together, and form a large irregular mass, inflamed, and often ulcerated. Acute pain is experienced in the part, when touched and after straining at stool; by straining too, such as are attached within the sphincter are pushed out, together with folds of the mucous membrane, and, if allowed to remain, are constricted by the sphincter, swell in consequence, ulcerate or slough, and discharge blood. The bleeding often is very violent in such cases, or when the tumour is punctured; the blood flowing in great quantity, and in a rapid stream. The hemorrhage is often periodical, both in males and females; in the latter, it would seem occasionally to take the place of the menstrual flux. The soft bluish tumours that are compressible, and fluctuate when large, furnish blood more readily and profusely than the hard and tuberculated.

Much irritation is produced by piles, and some of them are more irritable than others. There are often extensive excoriation of the nates around, and profuse discharge from the raw parts, particularly when the tumours are external. In such cases, flat, hard, warty excrescences often form in the cleft of the nates, and increase the irritation; and these are termed fici, mariscæ, and condylomata.

In internal piles, a frequent desire to go to stool is induced, and more or less of the mucous coat of the rectum is protruded and swollen. The tumour, along with the protruded portion of bowel, may become strangulated if not replaced. By such or other causes inflammation is excited, which often extends to the neighbouring parts, and terminates in abscess; but this is not so apt to occur from tumours seated high in the rectum as from those about the verge of the anus.

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largement of the capillary vessels of the mucous and submucous cellular tissue, the other in the formation of a small sac filled with fluid, coagulated, or organised blood. The latter, situated at the verge of the anus, or immediately within it, are composed partly of skin, partly of mucous membrane; they vary in size, from a pea to that of a small marble, are of a red florid complexion, hard and tender to the touch, and exquisitely painful when inflamed. The blood which they contain is at first fluid, but soon coagulates, and ultimately, if allowed to remain, becomes organised. Hence, in cases of long standing, the tumour is generally of a hard, gristly consistence, pale, and free from pain, producing no other than mechanical inconvenience.

In the other variety, the tumour is situated within the bowel, from six lines to two inches above the external orifice. Consisting, as was before intimated, in a varicose condition of the capillary vessels, especially the venous: it is soft and compressible, of a deep purple colour, extremely liable to bleed, and of various sizes, from a small bean to that of an almond or upwards. It rarely occurs as an isolated swelling, but in groups or clusters, as many as six or eight being sometimes situated upon a surface not more than an inch and a half or two inches in diameter. — Ed.]

The usual cause of piles is obstruction to the return of blood in the hemorrhoidal veins; and this may be occasioned by advanced pregnancy, habitual distension of the colon and sigmoid flexure, with hardened feces, or tumours of the abdominal viscera.

Inflammation of the Rectum is attended with excruciating pain, burning heat, and a feeling of contraction, increased very much when the parts are thrown into action by evacuation of the contents of the bowel, or of the bladder. The heat may be felt on introducing the finger, with the view of examination; by doing so, dreadful torture is produced, and such manipulation should not be had recourse to unless there is a suspicion of foreign matter lodging in the part, by removal of which the action might be cut short. The bladder is often affected sympathetically; there may be frequent desire to empty it, or else retention of its contents: this latter occurrence not unfrequently follows operations on the bowel, as for the removal of hemorrhoids, by ligature or extensive incision, which is neither warrantable nor requisite. The inflammation extends to the cellular tissue round the rectum, with swelling and increased pain; the pain is aggravated by pressure, and the patient is unable to sit erect. As the painful symptoms abate, puriform discharge from the membrane of the gut takes place, and often is very profuse. The morbid action sometimes extends to the other intestines, attended after a time with mucous or even bloody evacuations. When the affection is confined to the rectum, the feces and vitiated secretion are distinct from each other, and the former are usually of their natural appearance; but when the other intestines participate, to a greater or less extent, the feces are fluid, and intimately mixed with the morbid secretion.

Ulceration of the mucous coat, with continued discharge, often supervenes. Sometimes the peritoneal coat of the bowel is affected secondarily, and then the pain is much more acute and more aggravated by pressure.

Patients affected with hemorrhoidal swellings, — the action of whose bowels is irregular, and in whom the vessels about the anus are congested, — are peculiarly liable to inflammation and abscess in the rectum or its neighbourhood, from the application of cold or wet to the surface, particularly that of the lower part of the body. Ascarides often produce violent irritation in the extremity of the rectum, both in children and in adults; and the morbid excitation is communicated to the bladder, as will afterwards be noticed. Not unfrequently the inflammation is induced by a foreign body, either lodging in the cavity of the bowel or imbedded in its coats — as hardened feculent matter, alvine and biliary concretions, bones of small animals, needles, pins.

Effusion often takes place into the loose cellular tissue round the bowel, with hard swelling, followed by unhealthy and extensive suppuration. Rigors generally precede the formation of matter, and violent fever almost always attends, abating, along with all the painful feelings, on evacuation of the fluid. Still the discharge continues, and the patient is kept uncomfortable and unhappy. Resolution can very rarely be produced; suppuration is the almost uniform termination of the action, and in persons of bad habit this sometimes occurs in these parts without any assignable cause, and without previous warning. The purulent collections are often very extensive, both externally and internally, the integuments are all undermined, and in some cases it is difficult to ascertain the depth of the abscess, even with the aid of a long probe.

Owing to the loose nature of the texture surrounding the gut, abscesses near the anus often attain a great size, and extend deeply before there is much external indication of their existence; a hardness is felt on pressing the fingers deeply by the side of the tuberosity of the ischium; this is at first obscure, but gradually becomes more developed; and at last a small dark red spot appears, indicating that the matter has approached the surface, and is most superficial at that part. But the surgeon should not wait for the pointing here, as the matter may burrow much previously, and abscess form in the substance of the sphincter, or exterior to it. If the matter does not cause ulceration of the coats of the intestine, and escape into its cavity, pointing takes place, and the pus is discharged externally, in general through a small opening. The matter is of a very offensive odour. The external aperture, and even the whole cavity of the abscess, may be at a distance from the gut, but in most cases the matter is close to it: its coats are denuded, and often ulcerated through. The surrounding degree of induration, the quantity of contained matter, the extent of the cavity, and the situation of the opening, vary almost in every instance.

Cases occur of induration, often very extensive, in the neighbourhood of the anus, on one or both sides, with dark discoloration of the integuments, and burning pain. The affection resembles carbuncle. The precursory symptoms are soon followed by partial suppuration, and extensive sloughing of the cellular tissue. At first there is excitement of the system, but symptoms of debility, and flagging of the vital powers, soon present themselves — irregular pulse, delirium, disordered stomach, hiccough, vomiting, and cold extremities. The disease is one of great danger, and the patient can be saved only by free and early incision, and the judicious employment of stimulants.

In some instances the inflammation is merely superficial, seated merely in the integuments, and followed by slow collection of matter.

It is indeed seldom that a cavity formed by abscess near the anus fills up entirely, however large and free the opening into it may have been. The parietes contract, but the hardness around is not entirely dissipated; the opening may close for a little while, but is soon found again discharging, and may continue to do so for months or years. A sinus is thus formed. Fresh collections and openings, either externally or internally, are apt to occur, with extensive induration of the cellular tissue, and disease of the gut. Instead of a single sinus, a number of collateral ones are formed, all running into the main canal, like branches to a common-sewer, or by-lanes opening into one spacious street. The disease is one of frequent occurrence amongst females; and often from a false sense of delicacy its existence is not declared till it has advanced to a state of truly horrible perfection.

Fistula is generally the consequence of abscess in the cellular substance near the anus. By the term is understood a sinus or track, with narrow orifice and hard parietes, discharging thin gleety matter. If the track extends from the cavity of the gut to the surface, flatus must often pass through the narrow and tortuous canal, and, from a peculiar noise being produced by its passage, the name of Fistula has probably been adopted. The term cannot be properly applied to recent cavities of abscesses, but only when their sacs have contracted, their lining has become callous, and their discharge thin and almost colourless.

The fistula may be one of three varieties — blind external, blind internal, complete. The first denoting that the sinus opens externally, but does not communicate, either at its origin or elsewhere, with the cavity of the bowel. The second, that it communicates with the bowel, but does not open externally. The last, that it both communicates with the bowel and opens externally. Some contend that fistulæ are always complete, that they commence from within, and that the internal opening is always at one particular point; but such, according to my experience, is far from being the case.

Fistulæ occur in children, though rarely; generally in people advanced in life. The cavity of the sinus, after long continuance, becomes coated with an expansion resembling mucous membrane, and secretes a discharge of mucous character.

In every case, it is necessary that the surgeon should ascertain, as accurately as possible, the extent and nature of the fistula; and, with this view, examination with the probe is requisite. The probe is introduced into the canal, when the fistula is an external one, and directed through its windings, so as to discover its direction, length, and divarications; the guidance of the instrument is facilitated, and the information augmented, by the forefinger being placed in the rectum. Sometimes all the by-paths cannot be detected, until the orifice of the canal is enlarged. When the fistula is complete, the probe, entered at the external extremity, can be passed into the bowel so as to be felt by the finger in the rectum; but it must be remembered that the internal opening is not always at the inner termination of the sinus, but often seated more externally — the cellular tissue being destroyed to a considerable extent above it, so as to form a large unhealthy abscess, communicating with the main track of the fistula. But the gut may not be opened into, though denuded to a large extent, and forming part of the walls of the sinus; and in some instances, the sinus may not come within a considerable distance of the bowel.

An internal fistula is more difficult of detection. The symptoms leading to a suspicion of its existence are — puriform discharge from the bowel, increased on going to stool, and then accompanied with tenesmus; pressure on the side of the anus, causing pain, and sometimes an augmentation of discharge; and in many instances hardness, deeply seated, is felt. On introducing the finger into the rectum, the aperture in the coats of the bowel is perceived, or a part of the bowel feels more boggy and tender than the rest; through this point a curved probe, introduced along the finger, may be passed into the sinus, and being then directed downwards, reaches the outer extremity of the canal, causes the integuments to project, or is readily felt from the surface. The internal opening is usually immediately within the sphincter, seldom higher.* The discharge, in general, is rather profuse, the bowel is very irritable, desire to evacuate it is frequent, and the feces are often tinged with blood. There is a sensation of itching about the fundament, the heat of the parts is felt by the patient to be increased, he is unable to bear pressure there, and sits on one buttock: in most cases the bladder sympathises considerably. The giving way of the bowel may be produced by ulceration commencing in the mucous membrane, but is more frequently the result of inflammatory action in the surrounding cellular tissue. The aperture is the seat of acute pain when pressed upon, and during evacuation of the bowel. Great light is thrown on such cases by the use of a proper speculum. But its introduction can seldom be borne in cases of inflammation, abscess, or recent fistula. In ulceration of the coats within the sphincter it is useful. Considerable information can certainly be obtained by the finger; but to the sense of touch, however acute, it is better, when admissible, to add that of vision. The speculum, made of silver or steel, and having its internal surface highly polished, is introduced gently into the anus, and expanded fully; and by changing the situation of the instrument, and holding a light so as to illuminate the interior, the surface of the bowel for five or six inches above the anus can be examined accurately, as if it were an external part of the body.

Simple indurations and contractions of the lower part of the bowel follow long-continued irritation and inflammation of its parietes. The part is not an uncommon seat of stricture, and sometimes the bowel is constricted at two or more points near each other; frequently the stricture is extensive and firm, in other cases it is narrow, consisting merely of a thin band. It is often complicated with fistula; if so, the internal aperture is immediately above the stricture, and is caused by ulceration; abscess sometimes forms above the stricture, destroys the coats of the bowel at that point, burrows around, and not unfrequently points at a great distance from its origin; or sloughing and ulceration may take place in the coats of the bowel, and feculent matter be discharged through the opening of the abscess. In females, the vagina may be opened into in consequence of unhealthy suppuration in the cellular tissue, between that organ and the gut.

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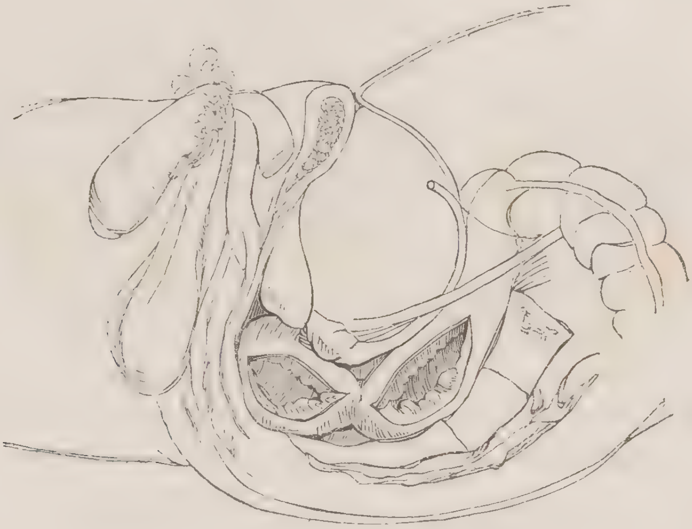
* [Until recently it was the opinion of surgeons, almost universally, that the fistula opened into the bowel at the distance of from two to three inches from the anal outlet; an error which often led to severe and hazardous operations, by which the unfortunate patient was sometimes rendered miserable for life. Mons. Ribes of Paris, who was the first to investigate the subject in a careful and extended manner, ascertained that the internal orifice is generally situated immediately above the place where the lining membrane of the rectum unites with the skin, sometimes a little higher, but *never* more than five or six lines. In eighty subjects affected with this malady it did not exceed this elevation, and in a considerable number it was not higher than a third or fourth of an inch. In my own operations and dissections I have rarely found the internal aperture more than a line or two above the internal sphincter muscle. The observations of the late Professor Bushe, of New-York, tend to a similar conclusion. — Ed.]

The existence of stricture is in general readily ascertained by examination with the finger; its most common situation is here shown;



the medical practitioner must not suppose that every obstruction, however slight, to the passage of a bougie into the bowel is owing to organic disease; the top of the sacrum naturally projecting forwards on the commencement of the rectum, in some degree opposes the entrance of any large body, and this circumstance is laid hold of by the unprincipled or ignorant; the patient is very often declared to labour under stricture of the bowel, when none exists. Some practitioners discover stricture in almost every patient with disordered digestion; the whole digestive apparatus is certainly thrown into disorder by obstruction in the lower part, but this obstruction is fortunately rare. In cases of tight stricture, the bowels are distended with feces and flatus; and if evacuation is not procured vomiting ensues, followed by enteritic symptoms, as in strangulation of the higher bowels. The gut above the stricture is always more or less dilated.

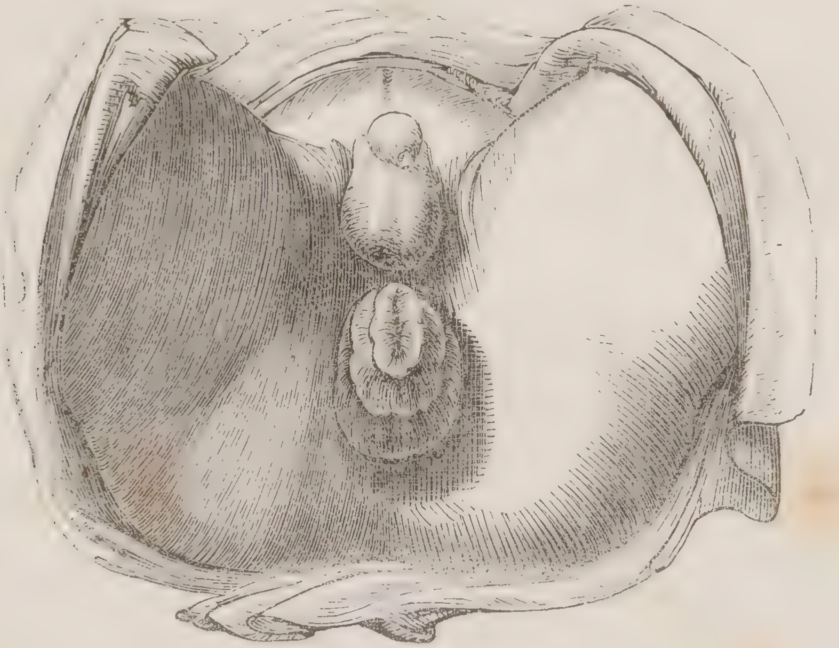
The symptoms which lead the surgeon to suspect the existence of stricture, are — difficulty in voiding the excrements; a long time occupied in the evacuation, with pain and much straining; small thin portions of feculent matter coming away, when the matter is consistent; discharge of puriform fluid, mixed with a slimy mucus; itching and heat in the parts; and irritability of the urinary organs.

Strictures of the urethra and rectum often coexist, as exemplified by the following case: — A middle-aged man, when in Holland, laboured under a very deep and extensive fistula in ano. Sinuses were divided in all directions, and some healed; one, however, remained open, leading towards the gut from near the tuberosity of the ischium on the left side. He was desired to keep this open by means of bougies, which, as many were used, he manufactured himself out of cloth and plaster. On one occasion a portion passed deeply, and could not be extracted; but his alarm at this occurrence was appeased on being told that the foreign body would be absorbed. His condition at that time was very miserable; and inflammation was often excited in the parts, with fresh collections of matter. At the same time, he laboured under stricture of the rectum and urethra. He applied to me fifteen years after the commencement of the disease. Then the most troublesome symptom was a constant itching in the perineum, and round the anus, preventing sleep, and causing much excoriation from involuntary scratching; besides, he was annoyed by seminal emissions, and frequent desire to make water. I first divided a small internal fistula, and some time afterwards operated on a large complete one; in the latter instance, a foreign body was felt deep in the wound, the incision was extended, and a large portion of bougie, firmly impacted, was with some difficulty withdrawn. Some days after, other portions of bougie were extracted along with numerous hairs; and these continued to be discharged for many weeks. The symptoms were much relieved. An occasional itching remained, but disappeared after the cure of a very bad stricture in the urethra. He recovered perfectly from the complication of diseases.

Schirro-contracted Rectum, a malignant and truly horrible disease, may be the consequence of inflammatory action, or of neglected stricture. The neighbouring parts are involved in cartilaginous induration; the surface of the bowel is lobulated and ulcerated, its cavity is contracted, and the discharge is profuse, sanious, bloody, and putrid; there is frequent desire to void the contents of the gut, but in general nothing but flatus and puriform fluid is evacuated; when feces do pass, dreadful pain is excited, and continues for some time. The difficulty of voiding feculent matter becomes greater and greater, frequent attacks of ileus occur, and in one of them the patient expires. During the progress of the disease, the functions of the bladder become disturbed; change of structure in it and in the vagina takes place; and frequently the cavities of the rectum, bladder, and vagina are laid into one by inveterate and malignant ulceration. The affection is more common in females than in males, and rarely occurs in young persons. The countenance has the sallow hue peculiar to carcinoma, and in the advanced form of the disease becomes still more cadaverous from profuse discharge of matter and frequent hemorrhage.

The cellular tissue, anterior to the rectum, is liable to become the seat of tumour. Malignant medullary formations occasionally form here, causing most distressing symptoms; by displacing the bowel they may obstruct its canal, and simulate stricture or schirro-contraction.

Prolapsus Ani. Folds of the lining membrane of the lower portion of the rectum are apt to protrude during evacuation, as already mentioned, in those labouring under hemorrhoids. These are readily replaced, and the painful feelings relieved, if the attempt be made before swelling and engorgement of the vessels and cellular tissue take place. Protrusion, however, is sometimes to a great extent; the sphincter is relaxed, and the lower part of the bowel is retained within it with difficulty; indeed there is often more of the lining membrane of the gut without the sphincter than within it. The mucous lining becomes insensible, thickened, and white; and the patient is subject to attacks of inflammation, with additional swelling, excoriations, and ulcers of the parts. Slight protrusion is very common, and patients who have long laboured under it are in the habit of reducing the bowel after every stool, in the intervals wearing a supporting bandage. They are subject, however, to constant uneasiness, and more or less puriform discharge from the parts; often there is a flow of blood while at stool; the health is undermined, and comfort diminished; all exertions are gone through with difficulty, and undertaken with reluctance. During exertion protrusion is almost certain to occur, and apt to be increased. The part most commonly prolapsed in time becomes hard, thick, and in a measure insensible; and new folds appear on extraordinary straining at stool, in coughing, or any exertion of the abdominal muscles.



Tumours occasionally grow from the coats of the rectum, and are of various consistence. They may be either vascular, or deposited in consequence of increased vascular action, and afterwards increased by addition of solid matter. They are to be removed either by ligature or incision, according to their situation, nature, and attachments.

Foreign bodies may lodge in the rectum — as bones, portions of hard indigestible meat, &c., introduced by the mouth — or clyster-pipes, bougies, &c., which have been passed up per anum. From being the source of constant irritation, and obstructing the functions of the part, they demand removal. Alvine concretions are now rare; they are usually situated in the caput cæcum coli, sometimes in the sigmoid flexure, or in the arch of the colon; they may descend into the rectum, and lodge there.

Children are sometimes born with the anus imperforate, the extremity of the rectum being covered merely by integument, or the bowel terminating an inch or two above the usual site of the anus; or the rectum may be wholly deficient. In the last case, the colon may end in a blind sac at the fundus of the bladder, or it may open either into that viscus or into the vagina.

Treatment of Affections of the Rectum. — In the treatment of hemorrhoids, the cause should be removed if possible; and this may suffice for the cure. When the tumours are recent and small, they may be made to disappear by the use of astringent ointments or decoctions, as of galls, kino, oak-bark, and by sedulous attention to cleanliness of the part. In inflamed tumours, blood may be extracted by leeches or punctures, and hot fomentations afterwards used. Recent hemorrhoids are sometimes got rid of at once by the puncture of a lancet,* by which a clot of grumous blood is discharged, with immediate subsidence of the swelling, and abatement of pain. When constriction of the internal tumours or folds of bowel by the sphincter has occurred, the tumour should be replaced if possible. In irritability of the sphincter, a bougie is sometimes used with advantage; and incision of the muscle, by which rest is afforded to the parts, will often effect a cure, after the failure of all other means: this is essential when rugged ulcers or fissures occupy the orifice; the division may be made on either side, certainly not in the mesial line. In most cases, the tumour must be got rid of by the knife or ligature. When the piles are internal, removal by ligature is to be preferred; the patient being made to strain, and thereby bring the tumours as low as possible, a ligature is placed round the base of the swelling, provided its form conveniently admits of it; otherwise the base is pierced by a fixed needle armed with a double ligature, the separate portions of which are applied tightly to the corresponding parts of the base. This operation is very inconsiderately and indiscriminately employed. It can only be warrantable when the tumours are so large as to obstruct the orifice so perfectly as to prevent evacuation, unless they are extruded. Before proceeding to this measure, the bowels should be emptied by mild and repeated purgatives, and afterwards all stimuli should be avoided. It is imprudent to apply ligature to several tumours at once, for serious consequences will most probably ensue, inflammation of the bowel, obstinate constipation, and general excitement.* Excision of such piles is contraindicated by the risk of profuse hemorrhage. The bleeding is into the cavity of the bowel, a coagulum is there formed which encourages the flow; and from this cause, and the peculiar situation of the bleeding point, it is with difficulty arrested. When the tumours are external, ligature may certainly be adopted; but here there is no objection to the use of the knife, and excision is much less painful and more speedy. The tumours, along with protruded portions of the mucous lining of the rectum that cannot be reduced, and are changed in structure and function, are readily taken away by the rapid stroke of sharp curved scissors. Or they may be laid hold of and stretched, and their base divided by one or more sweeps of a bistoury. The removal of these tumours, or of a portion of the loose fold of skin or altered mucous membrane which occupies the sphincter in the direction of the bowel, is in general followed by a cure of the prolapsus. The sphincter now acts fully, and on the cicatrisation of the open surface contraction of the tissues occurs to such an extent as to produce a permanent cure without interference with the internal parts. Should hemorrhage follow upon the removal of external tumours or folds, the surgeon has it completely under command. Pressure by a large graduated compress is generally sufficient.

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* [This is undoubtedly the treatment which should always be adopted in the sacculated variety of the disease, as it is not only free from danger, but affords the most speedy and effectual relief. If the blood, upon the presence of which the irritation and swelling mainly depend, be allowed to remain, it finally becomes organised, and so incorporated with the walls of the tumour that it is impossible to dispose of it in any other way than by excising the whole excrescence. — Ed.]

In inflammation of the rectum, the exciting cause often is not discovered; when detected it should be removed without delay. In simple inflammation of the part with violent fever, general bleeding may be required; and in all cases blood should be abstracted locally and freely. Leeches are to be applied to the verge of the anus, and the lower part of the perineum, and hot fomentations afterwards used. Internal antiphlogistics are at the same time not to be neglected. In retention of urine, or great irritability of the bladder, in consequence of the affection of the rectum, the perineum should be leeched and fomented, perhaps, also, the lower part of the abdomen; the use of the catheter should be avoided if possible. When induration takes place in the cellular tissue by the side of the anus, or in the perineum, suppuration must in all probability occur, and poultices, with occasional fomentation, are to be used, though only for a short time; for, as already mentioned, pointing of the matter is not to be waited for in this situation; incision must be had recourse to early, in order to prevent bad consequences. Leeching is sometimes used here, as in purulent formations in other parts, from gross ignorance of the real state of matters; and sometimes their use is continued after fluctuation is distinct, and until the pus begins to ooze through the leech-bites; such is very useless and very dangerous practice; in most cases the internal parts are extensively destroyed before the matter comes spontaneously to the surface.

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* [My own experience does certainly not accord, in this instance, with that of the distinguished author. I can recall to mind at least six or eight cases, several of them in delicate females in dilapidated health, in none of which I used less than two ligatures, and in some as many as three or four, without any serious consequences whatever. When the tumours are numerous, it can never be necessary to tie more than three or four at a time, since the inflammation thus induced generally extends to those around and effects their obliteration. It is always preferable, indeed, to repeat the operation, than to run the risk of producing too much irritation. — Ed.]

In the carbunculous state of the cellular tissue, near the rectum, with extensive infiltration, dark integument, and a tendency to sloughing, an early and free opening must be made wherever matter is suspected to have formed, however deeply seated, and in whatever quantity, and whether the parts are indurated or not; nothing but mischief can result from delay. When the cellular substance is destroyed, the incision must be proportionally extensive, to afford a free exit for slough as well as matter. During the suppuration which follows, the system will require good support, and most probably a free administration of stimuli.

It has been recommended that, in abscess extending along the gut, the cavities of the bowel and abscess should be at once laid into one by incision. I have done so, but always found the cure to be tedious. It is better that the matter should first be evacuated through an external opening, that the painful symptoms and constitutional disturbance should be allowed to subside; and that after the cavity has contracted, and the extent of the sinus has been ascertained, the operation should be performed. In the operation the knife is now employed; but in former times the ligature and cautery were in constant use. The old surgeons supposed that there was something malignant in the hardness and callosity attending this disease, and were not contented with opening the cavities, but endeavoured to dissect out the whole parts; and, if foiled in this, they finished the work with a red-hot iron. Indeed the practice of excision was recently in vogue in the Parisian hospitals.

But the operation for fistula has been much simplified. The bowel is generally so much separated from its connexions as to be incapable of again adhering, or of furnishing granulations; and, though capable, healing is effectually prevented by the frequent motion of the parts caused by the action of the sphincter and levator of the anus. One side of the cavity is fixed, whilst the other is in motion. It becomes necessary to lay the cavities of the bowel and of the fistula into one. This can generally be effected with great ease; a salutary degree of excitement follows the use of the knife, rest to the parts is procured, the edges are allowed to retract and adhere to the opposite surface, and the wound heals quickly from the bottom. The surgeon, in his operative procedure on these parts, must use both hands equally well, otherwise he must vary his position, and often put his patient in a very awkward predicament, more particularly if a female. The patient is placed in a stooping posture, with the legs unbent, or kneeling on a chair, and resting his arms on its back, the fundament being turned towards the light. The surgeon inserts the finger, well soaped and oiled, into the rectum, and with the other hand insinuates a curved probe-pointed bistoury into the sinus, using the instrument merely as a probe. Having reached the extreme depth of the canal, the direction of the instrument's point is changed so as to apply its cutting surface to the coats of the bowel, at that part. The instrument on being thus passed into the bowel is fixed by the finger, and by drawing both outwards, the coats of the bowel and the parts intervening between them and the sinus are divided. All collateral sinuses extending towards the perineum and buttock must be freely divided, for they cannot be expected to contract otherwise. Such is all that is necessary in the generality of cases; but it is evident that the steps of the operation, and the extent and number of incisions, must be varied according to circumstances. A great part of the affected bowel may be pulled down by a director before being cut, as is sometimes done; but the practice is useless and painful. Should hemorrhage take place, it may be restrained by stuffing the wound gently with lint; if this fail, the bleeding vessels are to be secured by ligature; but this is seldom necessary. The bowels should be well cleared out before the operation, so that two or more days may pass over without the parts being required to perform their functions; and, if the bowels are naturally loose, opiates may be administered. Afterwards copious evacuation is to be procured by enemata or gentle laxatives. It is necessary to prevent the external part of the wound from adhering, until the whole has contracted equally, and begun to be filled up by granulations from the bottom; and with this view a piece of lint is interposed between the margins. Stuffing the wound daily with large dossils of lint, smeared or not with irritating ointments, is attended with much pain, and certainly impedes the cure. The dressing should be simple and light, and introduced with gentleness and care. The first should be allowed to remain undisturbed till spontaneously discharged along with the feculent matter. In the greater number of cases, a second interposition of dressing is all that is required. In all cases, dressing should not be continued long; but as the cavity gradually contracts, discharging laudable pus, and becoming coated with healthy florid granulations, the interposed pledgets should be daily diminished, and soon omitted entirely. If the surgeon continue long to stuff the wound it cannot contract, will become callous as before, and a fistula will be reproduced. Injections into the wound, or the application of lint soaked in a gently stimulating lotion, are often beneficial in promoting contraction. But, as already stated, most fistulæ get well after proper incision, with but one or two dressings, and without any after application excepting abundance of soap and water. During the cure, the general health must be kept vigorous, and the state of the bowels strictly attended to.

In ulcer of the mucous lining, with irritability of action in the bowel, injections of tepid or cold water are useful, by removing irritating matters from the part. By means of a speculum ani the ulcer can be readily exposed; it may be touched occasionally with the nitrate of silver, in substance or solution, or, if very indolent, with a solution of the bichloride of mercury. When the irritation is very great, and the lower part of the bowel frequently in a state of spasmodic action, the sphincter may be divided so as to allow the parts to remain quiet; and anodyne suppositories or soothing enemata will then be used with much greater advantage than previously. To obtain reparation of breach of structure in any part, rest is a principal part of the treatment; and in the case of the rectum and other mucous canals it is preëminently required.

Strictures of the rectum are treated by bougies of wood, plaster, or elastic gum, introduced at intervals, and gradually enlarged. The bougie should be smooth in the surface, and rounded at the point; also slightly curved, so as to suit the figure of the bowel; and with a narrow neck, so as to remain without the irritation caused by distention of the sphincter. At first it should be of such a size as can without much difficulty be pushed past the stricture, and, as this relaxes, the size of the instrument must be proportionally increased till it completely fills the bowel when dilated to the natural calibre. The bougie may at each time be retained from a quarter of an hour to an hour, according to the feelings of the patient. Suppositories and enemata are at the same time employed; the latter to clear out the lower bowels, the former to allay the irritation which accompanies the disease, and which may be increased temporarily by the bougies. When the stricture is callous, and will not yield by dilatation, it may be divided with the knife, and notched at various points of its circumference; and, when the parts have begun to granulate, recourse to the bougie will soon effect a cure. When fistula and stricture coexist, both are got rid of at once by the usual operation for the former, and by the after treatment peculiar to each.

In malignant contractions of the gut, all that can be done is to palliate the disease by anodynes, administered by the mouth, or applied topically. Injections, bland, and occasionally anodyne, tend to diminish irritation; bougies aggravate the disease. At the commencement, the diseased parts may be removed by the knife or by ligature, and relief and exemption follow, at least for a time; but no operation is warrantable in this or any other cancerous affection, when the morbid action has gained ground, and the disease is extensive. Female patients have by some been cruelly treated; the vagina and diseased bowel have been laid into one loathsome cavity, and though the patients have continued to pass excrement and discharge through this cloaca, with the symptoms undiminished, themselves miserable and obnoxious to others — still such cases have been reported as cures!

In prolapsus ani, the protruded parts are to be carefully reduced, and kept so by means of a compress supported by a T bandage; often a spring with a pad is used with advantage. In inflamed prolapsus, with ulceration of the mucous coat, the patient is confined to the recumbent posture, and soothing applications employed; and when thus the irritation has been removed reduction is performed; but the bowel seldom remains up till after the ulcerations have been healed. In chronic obstinate cases, the altered parts within the verge are removed by the knife or scissors with safety; contraction attends the cicatrisation, and so further protrusion, as already noticed, is prevented.*

By the speculum ani, assisting the eye and finger, the nature and position of foreign bodies in the rectum are ascertained, and their removal facilitated. They are to be extracted by the finger, by a scoop, or by forceps. It has been proposed by some to cut into the colon from behind, so as to open that part of the bowel which is unconnected with the peritoneum, when it is distinctly ascertained that alvine concretions lodge there. This might be put in practice when the case is clear and the symptoms urgent, but, as already observed, such foreign bodies are now very rarely met with.

In imperforate anus, when the bowel terminates high, it has been proposed to cut through the abdominal parietes, and open the sigmoid flexure, so as to establish an artificial anus. The proceeding is unwarrantable, both in congenital deficiency and in malignant disease of the bowel. There is no doubt a possibility of life being thus prolonged, but it is by no means probable, and scarcely desirable. In the more common cases, the bowel is opened, and the meconium evacuated, by a slight and safe incision in the site of the anus. Even through a considerable depth of soft parts, the impulse of the fluid in the bowel is distinctly felt during exertion of the abdominal muscles. If incision through the integuments and cellular tissue prove insufficient, a sharp-pointed bistoury is pushed onwards in the direction of the bowel, under the guidance of the forefinger of the left hand, carefully avoiding the bladder, vagina, and uterus, as also the vessels within the pelvis. To reach the bowel is an object of great consequence, yet the risk incurred in its accomplishment must be considered, and the incisions made within certain limits. The opening scarcely requires to be kept pervious by the use of bougies, the functions of the parts being sufficient for the establishment of the anus.

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* [Much may be accomplished in chronic cases by means of astringent injections, of which the best perhaps is a solution of alum in a decoction of oak-bark, in the proportion of two drachms of the one to a pint of the other. From two to three ounces of this should be thrown up the rectum twice a day; the bowels being at the same time kept in a soluble state by gentle laxatives, and the patient compelled to void his feces in the standing posture. In cases of an inveterate kind, in which the ordinary remedies prove unavailing, the operation of Dupuytren, which consists in cutting away some of the radiating folds of the skin around the anus, generally affords prompt and effectual relief. When the protruded part is large, it may be necessary to excise from four to six of these folds, and to prolong the incisions into the rectum as far as the junction of the skin with the mucous membrane. The object of this operation is to produce a diminution of the orifice of the anus, which it does by the cicatrization and contraction of the little wounds made in the operation. — Ed.]

[Persons often suffer from *pruritus* or itching of the anus, or in the parts immediately around. The affection is most common in old people, and in such as are of a weakly constitution. Women who have recently ceased to menstruate are also prone to it. The exciting causes are generally ascarides, hemorrhoidal excrescences, and a morbid state of the alvine secretions. Sometimes the skin around the anus is covered with an eruption of papulæ, or even tubercles, the former of which are often attended with vesication and the discharge of a thin, watery, irritating humour. Patches of a similar description are occasionally seen on other parts of the cutaneous surface; as the scrotum, thighs, back, and even the face and neck.

The pruritus, which is often very troublesome on retiring at night, so much so, indeed, as to prevent the patient from sleeping for hours, usually subsides after a few months, but is certain to return from the slightest irregularity in the diet, from fatigue, loss of rest, or from exposure to heat. "From constant rubbing the skin about the anus becomes thick, dense, and furrowed, even when there are no hemorrhoidal tumours. The furrows assume a radiated direction, and converge in the anus; they vary in number from six to ten, and are from a quarter of an inch to an inch in length."[a]

In the treatment of this affection the first object should be to ascertain, and, if possible, to remove, the exciting cause. Proper attention should then be paid to the general health, which, as was before stated, is often much impaired. Under such circumstances tonics may be demanded, such as iron, bark, or quinine, either alone or combined with blue-mass, sarsaparilla, or Plummer's pill. The latter articles are particularly serviceable when there is an eruption around the anus. The most useful topical remedies are, a solution of acetate of lead and laudanum, yellow-wash, the nitrate of silver, and the ointment of the proto-ioduret of mercury. Cold ablutions also afford great relief, and are indispensable to the patient's comfort.

Neuralgia of the rectum, a disease first described, I believe, by Dr. Montegre, of Paris, in 1812, is occasionally met with. It is most common in persons of a nervous, irritable temperament, from the age of thirty to forty-five or fifty, and who are subject to similar attacks in other parts of the body, particularly the face, stomach, testicle, or mamma. It is characterised by paroxysms of pain, which is usually described as of a tearing, burning, or lancinating nature, situated at the extremity of the rectum, from which it frequently extends to the sacrum, the loins, pubes, and genito-urinary organs. Defecation is painful, and the urine is discharged in jets or drops, attended with a burning or scalding sensation. The attacks commonly subside in eight or ten hours, but recur with tolerable regularity about the same period the following morning or evening, though sometimes not until the second or third day. During the intermissions the patient is, in great measure, free from pain, and passes his feces and urine without difficulty. The affection often continues for years, and the paroxysms are then apt to be more frequent and irregular.

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[a] Bushe on the Rectum, p. 220.

A remarkable instance of this disease is given by the late Professor Bushe. His patient was a middle-aged physician, of active habits, in tolerable health in other respects, but of a nervous temperament, and subject to occasional attacks of neuralgia of the face, stomach, and testicles. Several times a year he would be seized with pain at the extremity of the rectum and at the pubes, accompanied with frequent desire to void his urine; sometimes he suffered excruciating torments at the end of the penis, or posterior part of the urethra. The attacks generally subsided in twelve or twenty-four hours, and were almost always either preceded or followed by neuralgia in other situations. No remedies were of any avail. In another case — that of a nervous female, thirty-five years of age — the pain was seated over a spot about the size of a shilling, on the left side of the bowel, less than half an inch above the verge of the anus. For weeks the pain would almost wholly subside, when it recurred with extreme violence; her distress was generally greatest towards evening, and was always much increased during defecation. Mr. Mayo of London mentions the case of a man who laboured for several years under paroxysms of neuralgia of the rectum and the teeth. The attacks came on frequently during the day, without any assignable cause.

Neuralgia of the rectum, as other parts of the body, is almost invariably attended with a deranged condition of the digestive apparatus, and hence a mild but systematic course of purgation constitutes a primary object in the treatment. On no account should the rectum be allowed to become distended with fecal matter. After due attention has been paid to the secretions of the stomach, liver, and bowels, the best remedies will be quinine, iron, arsenic, strychnine or nux vomica, stramonium, the warm bath, and blisters to the sacrum. During the paroxysm, hot fomentations, anodyne injections, and opiate suppositories will be beneficial. In spite, however, of these and other means, the disease often continues for years with little mitigation, baffling the skill of the surgeon, and compelling the patient to spin out a miserable existence. — Ed.]

Affections of the Mucous Membranes of the Urinary and Genital Organs. — It has been previously observed, that these membranes closely sympathise with the skin and with the mucous linings of the digestive organs. Stimulating substances introduced into the stomach frequently produce irritation of the urinary organs; and if the stimulants be employed in large quantities, and continued for some time, inflammation of the mucous membrane, investing the bladder and urethra, will be induced, with vitiated and increased secretion from the parts. In children, dentition is a common cause of urinary irritation; and not unfrequently discharge from the urethra comes on during the cutting of the teeth. The application of acrid matters, as cantharides, to the skin, will occasion unpleasant effects in the urinary organs; and these unpleasant and distressing symptoms often supervene upon disappearance of cutaneous diseases. In short, the practitioner, in attending to affections of these parts, must ever bear in mind the close sympathy which exists between them and the external surface, the stomach, and the intestines, particularly the lower.

Of Gonorrhœa, or Inflammation of the Urethra. — The morbid action is usually limited to the extremity of the canal, seldom extending more than two or three inches from the orifice. There is itching and heat at the orifice, with swelling and redness of the glans, and of the lips of the urethra, and generally the whole penis appears more full than natural. When making water, the patient experiences acute heat and pain, often most agonizing — chiefly referable to the extremity of the passage, and extending for two or three inches backwards. The urine is discharged in a small and scattered stream, the anterior part of the urethra being diminished in calibre by the swollen and turgid state of its lining membrane. The diminution may be in part caused by spasm of the muscles surrounding the canal, in consequence of the morbid excitement in it; or by fear, as the patient dreads making water, well knowing the excruciating pain which he must in consequence undergo. During erection, there is great increase of pain. The lips of the urethra, and the glans around, are often tender, and partially excoriated through neglect of ablution. There is seldom, if ever, any breach of structure in the canal; there is discharge of increased and vitiated secretion, without ulcerative absorption; the matter is poured out from the relaxed, but entire, mucous membrane.

In severe cases, the erections are abnormal, and attended with much pain, constituting chordee. This troublesome symptom usually occurs during the night; the inflamed membrane is stretched, and great pain is felt along the course of the urethra. From extension of the inflammation to the vascular tissue around the canal, and effusion of lymph into it, the penis is bent downwards during erection, the corpus spongiosum not admitting of so complete distension as the corpora cavernosa. Sometimes a portion of the spongy body is obliterated permanently by the effusion, causing deformity of the organ, and imperfect erection. I have also seen the penis bent to an inconvenient extent from a similar affection of the corpora cavernosa.

After the uneasy and painful sensations have continued for some time, puriform matter, of a greenish or yellow colour, is secreted by the inflamed membrane, and discharged in profusion. The discharge changes very much as to quantity and quality, according to the intensity of the action and duration of the disease, and is also modified by the constitution of the individual. When the discharge is suppressed, either from the imprudence of the patient, or from bad treatment, the inflammation is much increased; and when the secretion returns it is in general thin and bloody. As the disease abates, the matter becomes thick, ropy, and less abundant, is seen only in the morning, and in quantity little more than sufficient to glue together the lips of the orifice; ultimately it loses its whitish or streaked appearance, becoming clear and colourless. The first attack of the disease is generally the most severe.

In neglected cases, the prepuce swells, often to a great size

During the progress of the gonorrhœa there is always a tendency to serous infiltration in the prepuce; and if the patient walk much without supporting the organ, or have the part exposed to friction, swelling will inevitably take place. From this cause Phymosis and Paraphymosis are apt to recur — affections that will be afterwards described. The inguinal glands often enlarge, but such swelling is generally small, and seldom suppurates.

Induration and enlargement sometimes occur along the urethra from effusion of lymph, or from obstruction and distention of the lacunæ. Suppuration may take place at these points, and the matter escape either into the urethra or externally. Swelling of the lymphatics of the penis is by no means uncommon in severe or neglected cases of gonorrhœa; a hard chord, tender, and extremely painful when pressed, is felt running along the dorsum penis, and terminates in the inguinal cluster of glands, which are in general also affected. Inflammation and abscess under the strong tendinous sheath that envelopes the penis occasionally follows the affection of the lymphatics. The whole penis swells greatly, with fever and much pain; the matter is confined, burrows under the unyielding sheath, and appears either at the junction of the glans and prepuce, or over the symphysis pubis.

Occasionally the inflammation is not confined to the extremity of the urethra, but pervades its whole extent, in consequence of maltreatment, neglect, or idiosyncrasy. On this account, abscess in the perineum, or over that part of the urethra which is covered by the scrotum, is no uncommon consequence of a badly managed clap; the inflammatory action extending from the urethra to the cellular texture exterior to it. The formation of matter is preceded by fever and great pain; the patient is unable to sit; and occasionally retention of urine takes place. The part affected feels hard, and extremely painful when pressed; it gradually softens, and at last fluctuates and points. But if the matter form deeply, behind the bulb and in the cellular texture beneath the perineal fascia, or in the situation of Cowper's glands, it may be a long time of appearing externally. Fluctuation should never be waited for; and in most cases there are distinct enough signs of the presence of matter long before fluctuation can be felt.

Some people are much more liable to inflammation of the urethra than others, and many are exposed to the ordinary causes of gonorrhœa without suffering, whilst perhaps they are readily affected by such animal poisons as produce disease of the prepuce and glans. Patients often give very ridiculous accounts of the way in which their clap was contracted. They will say that the infection was received in a common necessary, that the disease was produced by a blow, by a strain of the back, by taking drugs that did not agree with them, by drinking out of the same cup or smoking the same pipe with an affected person, by wearing tight boots, falling into a dirty pond, &c. They will exert their ingenuity to the utmost, in order to deceive their surgeon, and attempt preserving their moral character untainted. Discharge from the urethra may be occasioned by dentition, &c., as already mentioned; or may take place from calculi passing along and getting fixed in the urethra, or from irritations about the anus. Inflammation of the passage not unfrequently arises, to a greater or less extent, from the acrimonious condition of the urine. The most common cause, however, is the application of irritating matter to the lining membrane; and this may take place during coition with females suffering from leucorrhœa, or during their menstrual discharge; but gonorrhœal matter is the specific virus, and the application of it to the orifice of the urethra is by far the most frequent cause of inflammation of the canal. Irritating substances injected into the passage may, and often do, produce or aggravate the inflammatory action. Besides all this, irritability of the urethra is common in gouty individuals.

Gonorrhœa has been termed virulent when caused by gonorrhœal infection — simple, when induced by irritations such as those previously enumerated; the distinction is seldom attended to, and is of no practical importance. It has been supposed that the poison which produces chancre is the same with that which gives rise to gonorrhœa, the action being modified by the texture in which the virus is lodged: such an opinion has been found to be wholly untenable.

Gonorrhœa supervenes at various periods after exposure to the infection, from twenty-four hours to six or eight weeks, but generally in from ten to twenty days; often the time cannot be correctly ascertained; much depends on the idiosyncratic susceptibility of the urethra, on the degree of acridity in the matter applied, and other contingent circumstances.

When the discharge becomes more clear and thin, and the inflammatory symptoms have disappeared, the disease is termed *Gleet.* The passage remains contracted in some degree, from relaxation of the mucous surface; there is a desire to make water more frequently than usual, and the urine is passed in a tortuous or scattered stream; in many cases the discharge continues profuse. There is now no pain nor scalding during the passage of urine, but these are readily reinduced by slight excess; perhaps there is a trifling chordee. After connexion, the discharge returns as if fresh infection had been caught, though such be not the case; both in simple gleet, and in that attending stricture, the seemingly virulent symptoms come on speedily, often appearing within a few hours after the coitus. In gleet the matter is no longer green or yellow, but whitish and flaky; the globules are contained in a mucous instead of a serous fluid. The disease is usually attendant on stricture, but occurs frequently without any organised contraction, the discharge being furnished by the vessels of the surface, which have become weak and relaxed in consequence of previous excited action. In feeble constitutions, inflammation of the urethra is almost always followed by long-continued and intractable discharge.

A practitioner is not unfrequently asked when the infection of gonorrhœa is not communicable, and if an individual in whom the discharge is very slight, or has just disappeared, is likely to contaminate a healthy female. The question is a difficult one to answer. In general it is prudent to err, if at all, on the safe side — by expressing doubts, and dissuading from intercourse until all discharge shall have entirely ceased for a considerable time. Discharge is often brought back, as already observed, by the excitement of sexual connexion.

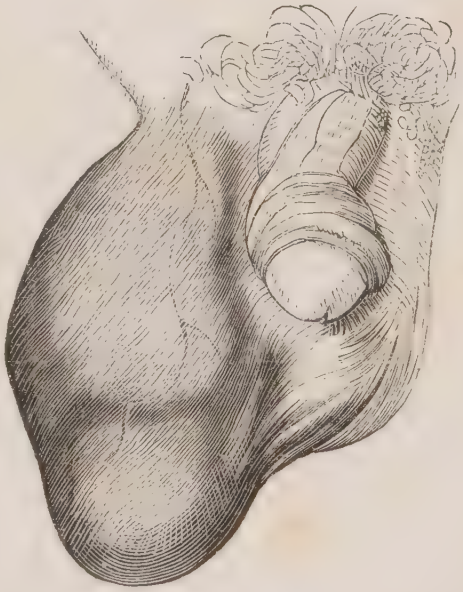
In simple inflammation of the urethra, with discharge, little or no treatment is required; if the patient keep quiet, and avoid the causes which give rise to the affection, the symptoms will disappear in a short time. But virulent gonorrhœa is often very unmanageable, particularly if it has been allowed to follow its own course, and consequently to make head before it is attacked. It is no easy matter to arrest it after the parts have got into the habit of furnishing discharge, and particularly if it has been aggravated by thoughtlessness and imprudence of the patient. All violent exercise should be avoided, as also indulgence in venery and liquors. A great variety of remedies, both external and internal, have been employed. General bleeding has been recommended, but never can be required in simple clap. If the bladder, or other important organ, become affected, depletion will be indispensable. Abstraction of blood by leeches from the perineum may be required, when from any cause the inflammation extends beyond its usual seat; and great relief is afforded by afterwards employing hot fomentations, or the bidet, and by diaphoretics given internally. Mercury was used in clap by those who conscientiously believed that the disease was the same as what they called syphilis. But it had been better far for mankind had such a term, or the notions associated with it, never been broached; or at least had mercury never been considered as necessary for the cure of affections of the genital organs. In gonorrhœa mercury may do much harm; it never can do good, either in the way of cure or prevention. The disease has often been contracted, whilst the system was saturated with the mineral. Frequent and violent purgings with neutral salts — a common plan of treatment amongst the unprofessional and inexperienced — are hurtful; the extremity of the rectum is irritated, and may inflame, and the urethra, from intimate sympathy, will suffer accordingly. Turpentine, copaiba, cubebs, buchu, &c., have been long employed in all forms of the disease; of these, copaiba, administered from the first, and not after the inflammatory symptoms have subsided, is perhaps the one chiefly to be relied on. It may be taken pure, with a little water or bitter tincture, or mixed with an equal part of honey; the copaiba may be given in gelatinous capsules, or made into pills with magnesia; it should be given at bedtime, and in a large dose, from a drachm to two drachms. The medicine may with prudence be continued after the disappearance of the discharge, though its beneficial effects are scarcely observable, excepting during the inflammatory stage. An unpleasant eruption, resembling urticaria, sometimes follows its employment; it appears on the inside of the lips, and on the glans penis, and if the drug is continued, the eruption spreads over the whole surface. Cubebs, though somewhat similar to copaiba in its virtues, often disappoints the practitioner. The two medicines may be given very advantageously together, made into a confection, and a bolus of it taken occasionally in wafer paper. This class of remedies, instead of stimulating, diminish greatly the irritability of the urethra or the other parts of the urinary organs. In severe cases it is of importance to increase the quantity of urine, and thereby diminish its acrimony, by the free employment of diluents, mucilaginous drinks, and alkalis; on this principle, infusion of linseed, containing more or less of nitrous æther, is very efficacious. The patient suffers much when the urine is scanty, and contains a large proportion of saline particles. Rest and moderate diet are of paramount importance as means of cure. Support of the penis, by a suspensory bandage, or otherwise, should always be attended to when the patient takes exercise, for many bad consequences will thereby be avoided; indeed it is a measure requisite in all affections of the organ, and particularly in gonorrhœa — when the prepuce, or even the whole penis, is liable to swell enormously. By low diet, and the frequent use of warm bathing of the part, or of the whole surface, the disease often disappears rapidly; but when the cure is supposed complete, a hearty meal and a few glasses of wine will suffice to bring it back with all the violent symptoms.

Cooling washes applied externally to the penis are of little use, and will seldom be long submitted to by the patient. Fluids injected into the urethra, so as to be applied to the affected part of the mucous membrane, are much more efficacious. When slightly stimulating, the relaxed membrane is constringed by them, the action in the part is changed, and a healthy secretion ensues; such are applicable after the inflammatory symptoms have subsided. But in many instances astringent injections are of much service from the very commencement; the morbid action seeming to be arrested, and the parts quickly brought into a healthy condition. Yet the use of such is not unaccompanied with risk, and the mildest are sometimes hurtful; the incited action is apt to extend along the passage; the discharge may be suddenly suppressed, and inflammation of the bladder or testicle will generally supervene; in short, the prominent symptom, discharge, may be arrested, but at the same time such violent inflammatory action may be induced as will be followed by change of structure in the canal, callosities, contractions, abscess, &c. The injections may contain nitrate of silver, sulphate of copper, sulphate of iron, sulphate of zinc, acetate of zinc, super-sulphate of alumina, or bichloride of mercury, in various proportions, or vegetable astringents may be used, as kino, galls, &c.: their strength may be gradually increased according to their effects. These solutions and infusions are injected by means of either a small syringe, or an elastic bottle fitted with an ivory tube, the point being smooth and rounded. This is carefully introduced into the orifice of the urethra, and the patient is recommended to press on the canal with his finger to prevent the fluid from passing farther than an inch or two. It may be thrown in two, three, or four times during the day, according to circumstances, and retained for a few minutes; at each time the patient should make water immediately before. The quantity injected at one time should not exceed a teaspoonful; more is unnecessary, and may do harm. By passing bougies or other instruments along the canal during active inflammation much mischief is done. When excitement has gone off, and discharge remains, advantage may be obtained by the internal administration of lytta or other stimulants. When contraction of the passage is suspected, or when, in spite of all means, no progress is made towards a cure, slight discharge continuing long without pain, and probably furnished by a relaxed portion of the membrane, recourse must be had to the occasional introduction of a full-sized bougie. Cold bathing, local or general, is sometimes useful.

If during the violent symptoms the discharge be from any cause suddenly suppressed, inflammation of the bladder, swelled testicle, or both, are to be dreaded; and endeavours should be made without delay to procure its return, as by leeching the perineum, fomentations, and the general warm bath.

The Consequences of Gonorrhœa occur in parts closely connected with the urethra by sympathy and function; or they are such as affect the constitution.

Of Hernia Humoralis, or swelled testicle. Pain and swelling occur in the epididymis, and soon affect the body of the testicle. The pain is most excruciating, the unyielding nature of the tunica albuginea preventing the vessels from relieving themselves fully, and inducing compression of the enlarging organ. Effusion takes place into the cavity of the tunica vaginalis, and thereby the tumescence is still more increased, this tunic from its great dilatibility readily accommodating itself to the accumulation of fluid within. Sometimes the effusion is bloody, more generally serous, and not unfrequently composed of serum more or less tinged with blood. The epididymis remains enlarged longer than any other part, often during the remainder of life. Sickness, vomiting, and violent fever, attend the progress of the swelling. Pain in the lower part of the abdomen is not infrequent, and may be mistaken and treated for enteritis. The spermatic chord becomes enlarged and tender. The pain is much increased when the patient assumes the erect posture, from the enlarged and pendulous gland stretching the inflamed chord. Uneasy feelings are complained of in the back, and pain there is sometimes so acute as to be compared by the patient to the sawing of his loins asunder. When the inflammation is violent, and effusion into the substance of the gland extensive, suppuration may occur; and in infirm constitutions this is not an infrequent, though remote, consequence of hernia humoralis. The testicle is said to be rendered useless by the supervention of this disease. Certainly it is in danger



of having its functions destroyed when the incited action is intense and the effusion great, and particularly if suppuration follow. The disease may be induced by violent exercise during inflammation of the urethra, bruising of the organ, suppression of gonorrhœal discharge, the imprudent introduction of bougies, the use of strong urethral injections, or debauchery of any kind, during inflammatory gonorrhœa.

In the treatment, complete rest occupies a prominent station. The inflamed organ must be supported; and all means which may have been employed with the view of checking gonorrhœal discharge must be abandoned. General bleeding may be necessary when the system is much excited; and in all severe cases blood should be abstracted copiously from the part, by the application of leeches or the opening of the scrotal veins, and the organ is afterwards to be fomented for some time, and then enveloped in a warm poultice. The bowels must be kept open, the diet must be very low, and the value of antimonial medicines as a powerful remedy in all inflammatory affections must not be overlooked. Cold applications are of little or no service at any period of the disease, and frictions with mercury and camphor had better be dispensed with. When the violent symptoms have subsided, bathing the part with a tepid solution of the murias ammoniæ is often useful; or it may be rubbed gently with an ointment containing a small portion of iodine, or with a liniment of soap and camphor, with tincture of iodine. Much relief is experienced from interposing between the scrotum and suspensory bandage a soap plaster, or one composed of equal parts of the gum and mercurial plasters; thereby the organ is defended from irritating friction and motion, and slight stimulation is produced and kept up on the surface. Blisters promote discussion if the swelling become indolent, but are very annoying to the patient. They require repetition, but generally are in the end effectual; perhaps the rest necessary during their use is of as much benefit as the application.*

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* [When the pain is considerable the camphorated liniment with morphia, laudanum, or belladonna, will be of great service. It should be rubbed upon the scrotum every four or five hours, avoiding of course injury to the inflamed testicle and epididymis. When the acute symptoms of the disease have subsided, under the treatment recommended in the text, the most efficacious practice is compression of the enlarged organ, by strapping it with the gum and mercurial plaster. Dr. Fricke of Hamburg pursues this plan in the very commencement of the inflammation, however severe, with the effect often of curing his patients in a few days. The plaster should be cut into narrow strips, not more than half an inch in width, and be applied in a circular manner round the testicle, which is to be previously drawn to the bottom of the scrotum. The first piece is to be placed round the insertion of the cord, just above the epididymis, and after the whole organ has been thus enveloped, another series of strips is to be applied from below upwards, to confine the first, and more completely equalise the pressure. Great care is to be taken not

Inflammation of the Bladder and posterior part of the Urethra may arise from other causes than suppressed or badly treated gonorrhœa; but, however induced, its symptoms and consequences are the same. The presence of calculi or other foreign bodies, over distention, &c., will be treated of hereafter, as causing irritation and inflammation of the viscus. Much vesical irritation is often produced and kept up by disease of the kidney.

When inflammation of the bladder is slight, it is attended by uneasy feelings referred to the perineum, pelvis, and glans penis; frequent desire to empty the organ; pain felt acutely before evacuation of the urine, and relieved immediately afterwards; scanty secretion of acrid and highly coloured urine; a discharge of slimy, tenacious mucus, either pure or voided along with the urine. In severe cases, most excruciating pain is experienced during the discharge of the contents of the bladder. The urine is often bloody; in general it is of a milky appearance, containing lymph or puriform matter, and vitiated secretion from the lining membrane. Micturition is almost constant, small quantities being voided at a time. Sometimes the inflammation extends to the ureters and pelves of the kidneys, causing violent pains in the loins, nausea, occasional vomiting, and colicky affections.

In very violent cases lymph is effused on the inner surface of the bladder, and may become organised; but such effusion is rare. I met with one remarkable instance of it in my own practice, and have seen several others. An old pensioner fell from a scaffolding, and sustained a severe contusion of the back. Retention of urine came on; it was drawn off regularly for some weeks, but then severe pelvic symptoms supervened, and at last nothing but a small quantity of purulent matter flowed through the catheter. The symptoms became urgent, the bladder was very much distended, and rose to the umbilicus; all endeavours to evacuate the urine per urethram failed, the instrument being always closed by the thick pus, and I was obliged to open the bladder pretty freely above the pubes. Much purulent matter mixed with fetid urine escaped from the wound, as also a false membrane which invested the mucous coat of the viscus. The membrane presented a flocculent appearance, in some places distinctly fibrous, in others was thin and transparent; its internal surface was irregular, as if from the deposition of minute granules of recent lymph. The patient died exhausted, after having survived about three weeks, voiding his urine partly by the wound, and partly per urethram. It should perhaps be mentioned, that those who saw

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to pucker the skin, which should be previously divested of hair. "If the pressure of the plaster occasions pain or irritation, the strips are to be removed till the inflammation and sensibility are diminished. In many instances the patient experiences almost immediate relief from the application." This remedy, which has been recently claimed by a European writer as new, appears to have been employed, with marked success, in the Pennsylvania Hospital, in the early part of the present century. — Ed.]

him immediately after the accident supposed that blood was extensively effused into the bladder, and attempted to extract the suspected extravasation by means of an exhausting syringe through a catheter, probably not passed into the bladder.

Occasionally, though rarely, the inflammation extends to the peritoneal covering of the bladder, and thence to the external surface of the intestines.

The bladder becomes thickened, and lymph is effused between its coats, from repeated attacks of inflammation, or from long continued irritation in consequence of resistance to the expulsion of its contents. The mucous membrane is thickened, relaxed, and of a flocculent appearance ; the fibres of the muscular coat are enlarged, and, bulging out, form projections along their course ; the mucous membrane is extended often to a considerable extent between the projections of the enlarged muscular fasciculi, forming pouches. The cavity of the organ is generally diminished in proportion to the thickening of its parietes, and there is a loss of balance betwixt the retaining and expelling powers.

Irritable bladder is generally a symptom of some other affection. There is profuse mucous discharge ; frequent micturition ; pain, increased by distention of the organ, and relieved by evacuation. The coats are more vascular than in the natural state ; sometimes the muscular is strengthened, and ulceration of the mucous membrane is not infrequent. Occasionally this latter tunic is the seat of tumour.

In the treatment of inflammation of the bladder, after removal of its causes, antiphlogistic means occupy a prominent situation, and are to be regulated according to circumstances. Leeches to the perineum and hypogastrium — soothing injections into the rectum — opium or hyoscyamus, either by the mouth or in the form of suppository — fomentation and the warm bath — are all valuable remedies in this affection. When injections into the rectum are used, they should not exceed three or four ounces, and they should contain from thirty to sixty drops of laudanum, or a corresponding quantity of the liquor opii sedativus. But an anodyne suppository is perhaps more simple and more efficacious. The effect of these remedies is almost instantaneous ; all pain goes off ; the patient becomes quiet, loses all recollection of his former sufferings, and often remains in a state of great comfort for twelve or sixteen hours. The suppository may be repeated as need be ; the preferable time for its exhibition is the hour of sleep. Camphor, given by the mouth in full doses, is a powerful remedy for allaying irritation of the bladder, from whatever causes induced ; as is copaiba, less nauseous and more trustworthy than cubebs or buchu. The copaiba will often remove speedily the most intense irritation, when all other means have failed. The bowels are to be kept gently open, and all stimuli disused ; diet should be low, drink copious and bland. Washing out the bladder with anodyne or other fluids, and the application of blisters to the perineum and neighbouring parts have been recommended, but are often more injurious than useful.

Of Stricture of the Urethra. — By stricture is understood a narrowing or contraction of a mucous canal, from deranged action, or from morbid alteration of its structure. It may arise from relaxation and turgescence of the parietes, or from effusion of lymph either under the lining membrane, or on its surface. Spasmodic stricture has been spoken of by some writers, but is most probably an imaginary disease. An irritable urethra, in which organic disease does not exist to any great extent, may contract at some point, diminish the stream of urine, and prevent the introduction of instruments, or retain them by closing firmly round, and in such circumstances the obstruction does probably depend on spasm of the muscular fibres surrounding the urethra; yet to such a state of the canal the term stricture cannot be applied with any degree of propriety.

True, organic, or permanent strictures of the urethra vary in their degree of constriction, becoming tighter when irritated by improper treatment, hard living, or exposure to damp or cold; indeed all mucous canals are sensibly affected by cold and damp. From these causes a combination may be produced of permanent stricture and spasmodic action; but, as already hinted, it would perhaps be well that this latter term, applied to urethral stricture, were forgotten, instead of remaining a convenient excuse for want of knowledge or dexterity. Spasms of canals and cavities, unusual membranes, adhesions, sacs, and cysts, are too often met with in the practice of surgery, and are said to prevent the practitioner from accomplishing the objects of his operations, so as to put the patient to a great deal of unnecessary suffering, and even endanger his life. The old writers supposed that obstruction of the urethra arose from growths, warts, caruncles, or carnosities in the passage; and even in the present day such causes would sometimes appear to be more accredited than they ought; small excrescences do sometimes form on the membrane, though very rarely.

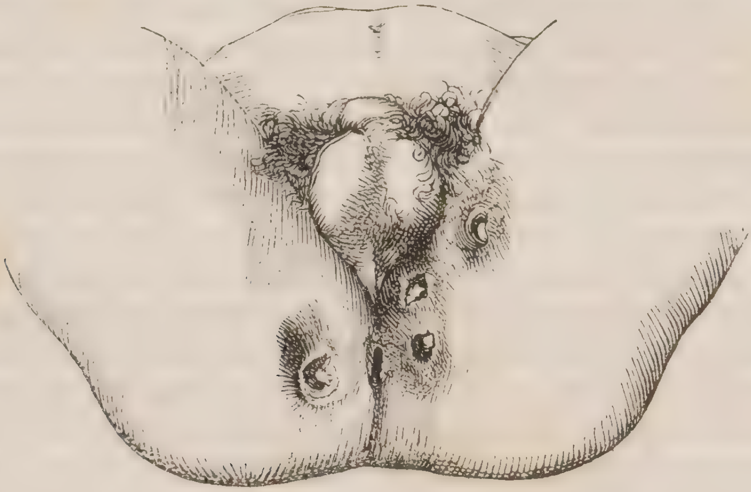
The true stricture is the result of inflammatory action in the part: at first possibly serous effusion takes place beneath the membrane, and elevates it into an œdematous swelling, which, according to its extent, obstructs the canal; the lymph is deposited both beneath the membrane and external to it, becomes organised, and forms a permanent and more unyielding obstruction. Strictures are of various kinds. The bridle stricture is rarely met with; a membranous band of organised lymph is said to traverse the canal, and, according to the thickness of this membrane, the flow of urine is more or less impeded; in the majority of cases the morbid formation is thin and delicate, but still sufficient to scatter and diminish the stream. When a soft bougie is introduced, it is resisted by the stricture, and on examining the instrument when withdrawn, the transverse and central impression on its point marks the existence of the bridle. The urethra is sometimes narrowed by a circular membranous ring projecting into its canal, composed of swollen mucous membrane with subjacent effusion, and presenting the appearance of a thread having been tied round the passage. Other strictures occupy a considerable portion of the urethra, from a quarter of an inch to two inches or more; differing from the preceding only in the effusion and membranous swelling being more extensive. Others are irregular, the contraction being not uniform at the narrowed point, and sometimes only one side of the canal is affected. Some are very firm and gristly, the effused lymph having become much condensed after organisation; others are less dense in their structure, and exceedingly elastic. From repeated attacks of inflammation at the constricted part, and around, additional lymph is effused and organised, and thus the extent and tightness of the stricture is increased.

The urethra is generally constricted at those parts which are naturally the tightest; at the orifice — betwixt three and four inches from it — and betwixt six and seven inches from that point; the most frequent site is perhaps anterior to the sinus. Contraction of the orifice is frequently the consequence of cicatrisation, and generally proves obstinate; in some cases the smallest probe is passed with difficulty. Considerable portions of the anterior part of the canal suffer contraction from the effect of ulceration; and congenital malformations of the orifice give rise to many affections both of the urethra and bladder. Contractions in different parts of the canal depend much upon one another.

When a tight stricture exists, the passage anteriorly is never fully distended, and becomes permanently contracted in consequence; whilst more or less dilatation is produced behind the tight part, wherever that may be. The enlargement often is very great, the urine lodges in the cavity formed by dilatation, and can be pressed out in a stream, or dribbles away after the patient supposes that he has done making water. Mucous and sabulous deposits often lodge in it; and calculi are occasionally retained there, may attain a large size, and may give rise to very unpleasant and even dangerous symptoms. Not unfrequently ulceration takes place behind the stricture, and the urine becomes insinuated into the cellular texture; but this tissue immediately around is in general condensed previously to the giving way of the canal, and so prepared by lympathic effusion as to oppose effectually extensive infiltration. Such is not the case, as will afterwards be explained, when solution of continuity in the urethra, or of the cyst of an abscess, takes place in consequence of distention of the bladder.

In the gradual escape of urine by ulceration behind the constricted point — the urethra being neither altogether obstructed, nor nearly so — abscess forms in the cellular tissue, exterior to the ulcerating part. The suppuration is often slow in its progress, and imparts to that part of the perineum a stony hardness. Repeated collections of matter may form, and, if the cause be not removed, numerous openings will form in the scrotum and perineum, and through them fetid matter and urine will constantly and involuntarily distil. The patient is reduced to a miserable state; the neighbouring parts are excoriated, and exhale a noisome odour, his body and bed-clothes are soaked and rotted by the discharge, and the atmosphere to a considerable distance around offends the nostrils. *Fistula in perineo* is established.

Ulceration and perforation of the urethra from stricture seldom takes place anteriorly to the scrotum; but ulceration often is induced there by retaining instruments long in the passage, and may be followed by sloughing of the integuments, abscess in the cellular tissue, or both. Occasionally the urethra communicates with the rectum in consequence of ulceration, escape of urine into the cellular tissue, and formation of matter. The symptoms of stricture are often much relieved after the formation of fistulous openings; and the cure can then be much more easily accomplished than formerly, the passage being less irritable. When the fistula is free and open, allowing the urine to escape readily, the natural passage contracts, and will become almost entirely obliterated, unless means are taken to dilate it, and to diminish the unnatural opening. Neglected aggravated cases are met with, in which the urine has passed entirely through the false passages for years, the urethra and penis, anterior to the stricture, being both rendered completely useless; but even such cases can, by proper management, be relieved, or permanently cured. Ulceration of the urethra, originating in consequence of stricture, may proceed even after the stricture is removed, and give rise to abscess and fistula.



Many patients labour under stricture, and even tolerably bad ones, without being aware of it. But the surgeon is led to suspect the existence of stricture, by complaints which the patients wish to be relieved of, and which they often suppose to arise from totally different causes — pains in the loins or hips, indolent swelling of the testicle, or of the inguinal glands, irritability about the fundament, gleet. On inquiring about the stream of urine, the patient may declare that it is as good as possible; and many say so without intending to deceive, for the stream diminishes so gradually, that the patient is not aware till after he is relieved that he has been voiding his urine in a very shabby and imperfect manner. On questioning further, it is discovered that the stream is forked or twisted, or divided into several small ones; that there is frequent desire to empty the bladder, during the night particularly; and that at first the urine comes away only in drops. A long time is occupied in passing even a small quantity of urine, and the patient has to strain much; in bad cases he is almost always obliged to go to the water-closet when inclined to make water, lest the contents of the rectum be evacuated by the great exertion of the levator ani and abdominal muscles, necessary to overcome the obstruction in the urethra. By the straining hernia is also frequently induced.

In consequence of the almost constant endeavours to overcome the resistance afforded by the stricture, the bladder becomes much strengthened in the coats, and diminishes in size. All the coats are affected, but particularly the muscular; the surface becomes fasciculated; the fibres grow fleshy and strong, and are collected in large bundles. Cysts form, often of a large size; some are caused by interlacement of the enlarged muscular fibres, others are produced by outward protrusion of the mucous coat. This membrane being, by excessive muscular action in the viscus, pushed between the enlarged fasciculi, dilates into a bag, and forms a cyst of greater or less size, communicating with the cavity of the bladder, generally by a narrow neck; the protruded membrane is thickened by new deposit, and ultimately the parietes of the cyst, in some degree, resemble those of the bladder. Cysts of this description are usually situated near the fundus of the organ, and often attain a large size; in some cases the cyst nearly equals the bladder in capacity; and the two seem to form one large organ contracted near the middle. The secretion from the surface of the bladder and cysts becomes vitiated, is much increased in quantity, and passes off along with the urine or after it — sometimes in solution, often separately. In severe cases the ureters and pelves of the kidneys dilate, and their mucous surfaces also contribute to furnish the discharge, in general slimy, ropy, and tenacious, sometimes puriform. Discharge also takes place from the stricture, or rather from the dilated portion behind it; it is a kind of gleet, very apt to be increased by excess in drinking and venery. After debauchery, the stream of urine — which was previously not much affected, at least to the patient's observation — comes to be very small; and frequently the urine can be voided only in drops, and that with much labour. Besides, the balance between the retaining and expelling powers of the bladder is often lost, and either incontinence or retention of urine is the consequence. Though the urine be much obstructed, even when the stricture is not very tight, the flow of the semen is not; the degree of contraction must be very great to prevent ejaculation of the latter fluid. Indeed, during the healthy state of the parts, the whole urethra is much narrowed, as well as shortened, during seminal emission in coitu, from forcible action of the surrounding fibres, and injection of the corpus spongiosum; and the momentary contraction of the passage in such circumstances is perhaps greater than almost ever occurs in consequence of disease. Sometimes the seminal fluid passes back into the bladder, from an inverted action of the canal, and is evacuated along with the urine; nocturnal emission is a frequent concomitant of stricture. That an inverted or sort of antiperistaltic motion sometimes exists in the urethra, is shown by a soft bougie being in such cases drawn into the bladder after having been passed but a short way into the urethra.

In cases of bad stricture, the complexion is sallow, the countenance anxious, and the general expression of the features so peculiar as to be almost pathognomonic. The lower limbs become emaciated and weak. Gout often accompanies stricture, and paroxysms of it are induced by irritation of the urethra; the canal itself is said to be sometimes affected with a gouty action.

Stricture may be caused by inflammation or long-continued irritation of the urethra, however induced — by mismanaged virulent gonorrhœa — by stimulating acrid injections — by piles, and other irritations about the fundament — by calculi passing along the urethra. That gonorrhœa is a very frequent cause of stricture has been long known — "If the case be slubbered over, and long delayed, caruncles arise in the urethra, and in progress of time a carnosity." The passage or lodgement of calculi in the canal has induced stricture even in children: and calculus in the bladder is supposed sometimes to produce disease in the urethra, and *vice versâ*. Strictures are often caused by falls or blows on the perineum, and such cases are of the very worst kind; in some the urethra becomes almost entirely obliterated; in most the stricture is extensive and callous; and in all the disease is overcome with difficulty.

When stricture is suspected, the urethra must be examined. A soft white-wax bougie is very well adapted for ascertaining the state of the parts, but must be used very gently. If pushed forwards rashly and with force, the instrument yields before the stricture, and when withdrawn, is found twisted like a screw, or doubled backwards on itself. The vessels of the urethra may be torn, and hemorrhage, with great pain, ensue. The bougie should be slightly curved in its farther extremity, warmed either at the fire or by friction with the fingers, and well oiled, previously to its introduction. It is then passed softly along the canal till its progress is arrested; thus the situation of the stricture is ascertained. Then a little more pressure is employed for a short time; if the instrument have not become insinuated into the constricted part, it will resiliate on removal of the pressure from its free extremity; if it is passed into or beyond the stricture, it is firmly grasped by that part of the urethra, and retained; thus we discover the degree of contraction; and from the extremity of the bougie receiving and retaining the impression made on it by the contracted part, we can form an accurate diagnosis regarding the nature and extent of the stricture. The information thus acquired is afterwards acted on.

The principles on which the cure is to be conducted are the same in almost all cases; but the particulars of the treatment must vary according to circumstances. In slight cases, the gentle introduction of a moderately-sized bougie produces a cure by removing the irritability or susceptibility of the surface; the relaxed membrane is stimulated by the distention made with a bougie, and soon regains its natural tone. It may be necessary to repeat the introduction of the bougie a few times, at considerable intervals. In tight organic stricture something more is required; the constricted part must be dilated gradually. Much dexterity and management is often required to pass an instrument through a tight stricture, particularly if inflamed; and in such circumstances the attempt should not be made but on good grounds, and to relieve urgent and dangerous symptoms; but after a bougie or catheter, however small, has been got past, the disease is completely under the control of the surgeon, and a cure must follow if the treatment be properly conducted, and if the bladder and kidneys have remained tolerably sound. The effect of an instrument passed through an organic stricture is to remove the irritability of the lining membrane, to excite the absorbents to remove the newly-formed parts, and to dilate the passage: it may be supposed to act in some measure on the same principle as a bandage applied to a swelled extremity. The instruments introduced must be gradually enlarged till one readily passes of the full size; that is, one that enters the orifice with some difficulty, and fully distends the rest of the canal. Numerous contrivances have been employed for the dilatation of strictures; but the preferable instrument is a silver catheter, or a sound made of silver, of steel, or of plated metal. A soft or gum-elastic bougie is sometimes useful in ascertaining the nature and situation of the stricture; but in the treatment it must give place to the metallic, slightly conical at the point. This, in the hands of a well-qualified person, can be more surely and readily directed than a flexible one, and in its use there is less risk of injury being inflicted on the passage; besides, it does not yield to the action of the diseased part. The practitioner must be provided with a full assortment of catheters and metallic bougies, each one differing from the other in size; for, as already observed, the size of the instrument passed must be gradually increased; and, besides, the calibre of the canal varies much in different individuals; what is a full size for one person may be but a trifle in the urethra of another. The bougies are arranged by what is termed a size-plate, or gauge, a flat piece of metal, containing fifteen or sixteen circular perforations, which commence about the size of a small crow-quill, and gradually enlarge in diameter. These apertures are numbered, and the bougie which fills one has the corresponding number imprinted on it. By reference to the numbers, the surgeon is at once made aware of the progress he has made towards a cure.

In the more common and simple cases, a regular and gradual ascent in this scale is all that is required, allowing a proper interval to elapse betwixt the introductions. But in tight and unyielding stricture, small, firm, silver catheters are required, One of these of a size proportioned to the contraction of the canal — and the calibre often must be extremely minute — is passed through the stricture or strictures by dexterous, persevering, and at the same time gentle pressure in the proper direction. If the diseased part be anterior to the bulb, it can be grasped between the fingers of the left hand, whilst with the right the instrument is insinuated into it; thus the part is steadied, and the course of the catheter made more certain and safe. If it be posterior, assistance in the introduction, and information as to the direction and progress of the instrument are obtained by the forefinger of the left hand being placed in the bowel; and this is the more necessary when the stricture is of an elastic nature. Considerable experience is requisite to enable the surgeon to be aware of the progress he is making with the instrument, and whether or not it is advancing fairly in the canal; much information as to this is imparted by the sense of feeling. If the point of the instrument be within the contracted part, it will be felt embraced and obstructed, and on withdrawing the pressure, it will be stationary; if it have not entered the stricture, but is pushing it before it, resilience will be felt as soon as the pressure is either diminished or removed. The sensation imparted when the instrument has left the canal, and is entering into a false passage, is of a peculiar grating nature, and when once felt, will scarcely be forgotten or mistaken. By means of a good knowledge of the natural course of the urethra, and an acquaintance with the feelings just alluded to, but which cannot be graphically described, the surgeon of experience is enabled to avoid blunders, and to pass an instrument with safety through the tightest strictures. It is, however, an operation of very great difficulty in aggravated cases, perhaps the most difficult in surgery; facility in passing the catheter is acquired only by practice and experience. The greatest caution is required, along with considerable fortitude and perseverance.

When the instrument has been fairly lodged in the bladder, it is to be retained. A tape is attached to each of the rings at the neck of the catheter, is brought under the thigh, and fastened to a bandage passed round the waist; this simple retentive apparatus is quite effectual, and suits the erect as well as the recumbent posture. A peg, of metal or wood, is placed in the mouth of the catheter, that the patient may be kept dry, and at the same time have it in his power to relieve the bladder as often as necessary. The instrument should be retained for twenty-four hours at least, and, if the patient can bear it, for forty-eight, or even more. At first it occasions considerable uneasiness, pain, and excitement, but these gradually subside; when severe, they may be allayed by opiates. The parts make efforts to get rid of the foreign body, and these efforts are salutary. Discharge takes place from the membrane, and oozes by the side of the catheter; relaxation occurs, often to a very great extent; and, on moving the handle of the instrument, it is found to be not only less firmly grasped, but to possess considerable freedom of motion in the contracted part. Thus a most successful inroad is made upon the disease, and the after treatment thereby happily abridged. The instrument is withdrawn, and time afforded for the parts to become quiet. After the lapse of two, three, or four days, according as the uneasy feelings disappear, a larger instrument is introduced, and retained perhaps for half an hour; and the successive introduction of instruments — sounds being now adopted — at proper intervals, and in proper graduation, is continued as in ordinary cases. Sometimes, though rarely, the good effects of the first introduction and retention of the instrument quickly disappear, the stricture becoming tight and unyielding as before; when this takes place, the practice is to be repeated, but not till after several days, and then the instrument will be retained with advantage for a longer time than before, provided no untoward symptoms are caused by its lodgement. There are very few strictures, indeed, which will not yield to this treatment, when judiciously planned and perseveringly followed.

Fistulous openings generally close in a short time, when once the urethra has been widened. Their contraction may sometimes, however, prove slow and imperfect, even after the stricture has been entirely removed, and the application of the cautery may be requisite; to accomplish this, when the opening terminates in the rectum, a speculum ani is required, by which to view the aperture, and ascertain its site, and along which to pass the heated wire with safety to the bowel. The cautery is not to be applied so as to produce an extensive slough, and much loss of substance, but lightly to the edges. On the separation of the superficial eschar, the margins are raw, excited, and swollen, with a disposition to granulate; and during cicatrisation of the sore, considerable contraction takes place, independent of the formation of new matter. After the contraction thus effected has occurred to its full extent, and not before, the cautery is reapplied; and by a few repetitions of the instrument at long intervals, the opening is brought to close.

At one time attempts to destroy the contraction of the urethra, by the application of caustic to the stricture, were in great vogue; but the total inefficiency of such practice is now generally acknowledged. The armed bougie was in many cases applied hundreds of times, at considerable intervals; and the mode of treatment, though trying, tedious, and hurtful to the patient, must have proved useful to the surgeon — but to him alone. Years were spent in such trifling, and not unfrequently serious consequences followed this treatment, or rather neglect, of the disease. Cutting catheters are dangerous, as well as inefficient for the cure of stricture; thrusting at the end of a long stricture can avail but little, and in the hands of most practitioners the instrument is as likely to perforate the coats of the urethra as to enter the stricture.

Incision of stricture may be required in retention of urine, scarcely otherwise. The practice is noticed under the treatment of retention. In stricture anterior to the scrotum, it is well to avoid incision, if possible, as it generally is so, for a wound there is healed with difficulty, if at all.

Retention of Urine is not to be confounded with *suppression* of the secretion from the kidneys, arising from disorder of the structure or function of these organs. The kidneys perform very important functions in the animal economy, and complete suppression of their secretion under any circumstances is a very suspicious and dangerous occurrence.

In the healthy state of the urinary organs, when the powers of each correspond, the urine passes without almost any exertion on the part of the patient; the action of the levator ani and abdominal muscles is scarcely required. But when either structure or function is disordered, the balance between the parts is upset; additional assistance is necessary for expulsion of the contents of the bladder. The symptoms of retention differ according to the state of the parts and the cause which has induced it. The bladder varies in size, and in distensibility. In some cases the organ yields readily to the accumulation of fluid within it, rising high in the belly, reaching even the umbilicus, and forming a large, oval, tense, fluctuating swelling, apparent to the most careless and casual observer. The swelling and fluctuation are in such circumstances so distinct, that the disease has actually been mistaken for ascites. Again, all the symptoms of retention may exist, and all its bad consequences result, without any apparent swelling of the abdomen. But then the distended bladder can always be felt by the finger introduced into the vagina or rectum; indeed its posterior fundus bulges in towards the cavity of the gut, in every case, before it ascends upwards in the abdomen. Sickening and agonizing pain, with great anxiety and ineffectual straining, generally attend distention of the bladder to any great degree. When the distention is allowed to continue, urinous fever supervenes, the circulation is accelerated, the patient perspires profusely, and exhales a urinous odour; delirium comes on, followed by sinking, and, if the cause is not removed, coma terminates the distressing train of symptoms. In other instances the painful feelings subside after some time, and the urine is discharged involuntarily from the urethra. The ureters lose the valvular structure of their vesical terminations, and become dilated; the pelvis and infundibula of the kidneys also enlarge, and all are distended by the accumulating urine. On relieving the bladder artificially, the pressure is taken off the secreting part of the kidneys, their secretion is generally renewed with great vigour, and the bladder is again filled rapidly. If the bladder is not relieved the secretion of urine is suppressed.

In many cases the urethra — the bladder more rarely — sloughs or ulcerates, unless preventive measures are adopted, and extravasation of urine takes place into the cellular tissue of the pelvis, of the perineum, of the groins, of the lower part of the abdominal parietes — into the cellular substance of the scrotum, and of the penis — the parts infiltrated depending of course on the point at which the urinary canal has given way. Under such circumstances the patient is sometimes rapidly destroyed, the extravasated urine appearing to induce speedy sinking, similar to the effects of inoculation with a most virulent poison. If the urine escapes into the cavity of the abdomen, the patient inevitably perishes, and that very speedily; and when the cellular tissue of the pelvis is the seat of the extravasation, little hope can be entertained of recovery, though the fatal termination may not be so rapid as in the former case. When the urine is effused into more external parts, as into the perineum or scrotum, the danger is also imminent, if the fluid is allowed to accumulate and become extensively infiltrated; but when it freely escapes externally, either spontaneously or by incision, there need in general be no great apprehension of immediate danger. In such cases the aperture in the urethra is found to be at first irregular and ragged; afterwards its inner surface becomes rounded off, and a papilla presents externally. The infiltrated cellular tissue is dark, fetid, broken down, and soft, sometimes seemingly in part dissolved by the putrescent urine; and, when the patient has survived a considerable time, it frequently resembles closely in appearance a portion of suppurated lung. When active practice is not adopted after extravasation of urine has taken place, the cellular tissue around sloughs along with the integuments; rapid depression of the powers of life ensues, with great disturbance of the sensorial functions. Death very soon relieves the patient from his sufferings; some few struggle through, and recover, after losing the coverings of the penis, of the testicles, and of the perineum.

The causes of retention are many; but the surgeon must know them all, as the treatment must vary according to the cause. They may be divided into such as weaken the power of expulsion, and into such as impede the progress of the urine in the urethra.

Retention of urine is caused by paralysis of the bladder, from overdistention, from injury or disease of the spinal chord, from pressure on the spinal chord or nerves. In such cases the bladder often attains a very large size. At first the accumulation produces all the uneasy symptoms formerly mentioned, but after some time these subside, and the urine drains away according as it is secreted, without, however, the original accumulation and tumour being diminished. This state of the urinary system is very common in old people, who neglect natural calls to empty the viscus during the night, or while sitting socially after dinner. The uneasiness gradually goes off, and when they at length think of making water, none can be got to flow. Sometimes they remain in this state — the bladder full, and becoming more and more distended — for days, drinking gin and water, juniper tea, or other popular remedies. Incontinence then takes place, and the dribbling of the urine affords considerable relief; this state of matters is often allowed to continue for weeks. Thus the power of expulsion may be lost for ever, though sometimes it is regained even under very unfavourable circumstances. I recollect attending a man upwards of eighty, labouring under retention of urine with incontinence, and whose bladder required relief by the catheter for ten or twelve days; at the end of that period the bladder regained its expulsive power and retained it; and cases are on record in which the power of expulsion has returned after the lapse of several months. Retention thus induced is often complicated with disease of the prostate gland or of the urethra. The patient, perhaps, has been for a long time incapable of emptying his bladder completely; a portion of the urine always remains in the most dependent part of the viscus, and the quantity retained becomes greater and greater, until from some slight cause the power of expulsion is lost entirely. In these cases the bladder, though much increased in capacity, is also much thickened.

Retention from inflamed urethra, attended with swelling and spasm about the neck of the bladder, is preceded by hardness and tenderness in the course of the urethra, and a smarting felt when a drop of urine passes along. Retention not unfrequently takes place during gonorrhœa, from the dread which the patient has of making water; and from the swelling of the lining membrane.

Retention from abscess in the perineum was formerly noticed.

Retention from injuries in the perineum. The urethra is either severely bruised, perhaps lacerated, or torn completely across; and if the patient attempts to make water before proper means are adopted, blood and urine are extravasated into the cellular tissue exterior to the canal. In cases of slighter injury, retention may occur on account of the inflammatory swelling of the parts supervening secondarily.

Retention from stricture of the urethra is of very frequent occurrence, and most difficult to manage. The state of the urethra and bladder in this disease has been already adverted to, but it is necessary to bear in mind the thickening of the latter, and the dilatation which uniformly takes place behind the stricture. All the urgent symptoms of retention may, in this case, arise from the accumulation of but a few ounces of urine. The bladder contracts frequently and very forcibly, causing great suffering. Temporary relief is experienced when the urethra gives way by ulceration, and the urine becomes extravasated into the cellular texture; the patient gets up, and, if in the dark, thinks that the stricture has yielded, and that he is passing urine naturally. But soon he feels a glowing heat in the perineum; the parts swell and become livid; violent constitutional symptoms come on, the discoloration advances, the integuments slough, ill formed matter is discharged, and disorganised cellular tissue mixed with putrid sanies is exposed. The parts exhale a urinous odour, which, when once smelt by the practitioner, can never afterwards be mistaken. Occasionally œdematous swelling of the penis takes place, particularly of the prepuce, when it has been pulled at and bruised during the patient's efforts to make water, and this must not be confounded with infiltration of urine; I have seen it occur some time after the bladder had been relieved by the catheter. Infiltration of putrid serosity into the cellular tissue of the prepuce, the subcutaneous tissues of the penis, scrotum, and lower part of the abdomen, occasionally also takes place to a great extent, after the bladder has been relieved by the catheter, the coverings are destroyed, and the patient may, even despite of active treatment, perish in consequence. In such cases, a small quantity of urine may possibly have escaped into the cellular tissue before the bladder has been relieved, so as to commence the mischief.

Retention from the lodgement of calculi. Temporary obstruction to the flow of urine is sometimes experienced from calculus in the bladder. Complete and fatal retention has arisen from calculi having become impacted in the urethra, and been allowed to remain there, blocking up the passage entirely.

Retention from affections of the prostate gland and neck of the bladder, inflammatory or indolent. In acute inflammation of the prostate gland and cervix vesicæ, the other parts around swell, the mucous membrane becomes turgid, and the mucous secretion is increased. Suppuration may take place, and an abscess, chronic or acute, form in the substance of the gland, or in the cellular tissue exterior; the parietes of the abscess may give way, and the matter discharged into the bladder, into the rectum, or into the cellular tissue of the perineum. Bloody and mucous discharge from the urethra, frequent desire to make water, sudden stoppage of the urine whilst making water, pain in the glans penis, and other symptoms of stone in the bladder, followed a fall on the back. Afterwards, a tumour pointed into the rectum, and was opened; purulent matter was profusely discharged, and afterwards urine escaped through the aperture. The patient died in three weeks, from irritative fever, with gastro-enteritic symptoms. Along with thickening of the bladder, and disease of its mucous coat, there was found a large abscess of the cellular tissue, communicating with an abscess in the third lobe of the prostate gland, and that with the cavity of the bladder.

When the affection is less acute, the prostate slowly enlarges, from opening out of its texture, and deposition of new matter in the interstices, it becomes hypertrophied. The whole gland may enlarge uniformly, but generally one part protrudes more than the others. When the third lobe enlarges, it necessarily projects into the bladder, or into the prostatic portion of the urethra, and there, acting like a valve, causes much more formidable obstruction to the flow of urine than does enlargement of the lateral lobes; the obstruction is the more complete the greater the distention of the bladder. At first, this lobe is but slightly prominent, and of a conical form; but as it enlarges, its regularity of shape disappears, the tumour is nodulated, and in general somewhat pyriform. It occasionally projects to one side of the passage. The affection is seldom met with, unless in old people.

In consequence of prostatic enlargement, pain is felt in the perineum, with occasional throbbing, and a sense of weight; there is frequent desire to make water, the bladder is irritable, and discharges ropy mucus. There is more or less irritation of the lower bowels; there is an almost constant desire to empty the rectum, from a feeling of fulness there, and pain, often severe, is felt on going to stool; when the enlargement is great, the bowel is considerably compressed, and the feces, when solid, are passed flattened like portions of tape. Frequently there is thin mucous discharge from the urethra. In making water, the urine, as it were, hesitates, and after a while passes away, at first in drops, and afterwards in a scanty and irregular stream; pain is felt at the point of the penis, in the loins and hips, and often in the inside of one or both thighs. On attempting to pass the catheter, its extremity is obstructed in the prostatic region, and the swelling can be felt by the finger introduced into the anus. Examination of the tumour, per anum, is very often a painful proceeding; it is best accomplished after a catheter or sound has been introduced. The disease is often coexistent with calculus in the bladder. The tumour is very seldom malignant, but proves both troublesome and dangerous from its size. The bladder may become distended in consequence, though retaining the power of partially relieving itself; or the urine may come away involuntarily after some time; or retention may be complete, and, if not relieved, the bladder may slough.

It is to be recollected, that in retention of urine, from whatever cause, and particularly in that arising from prostatic enlargement, the urethra is elongated, and the bladder rises into the abdomen like the gravid uterus. The reason of such change of relative situation is sufficiently obvious, being chiefly mechanical.

Fungous, or other tumours, furnishing blood or vitiated puriform matter, now and then grow from the internal surface of the bladder, unconnected with the prostate gland. Worms, too, occasionally lodge in the bladder. Either of these circumstances may induce retention of urine. Another cause of obstruction is hernia of the bladder.

There is no disease in which the patient is more liable to be 'bungled out of his life,' than in retention of urine. Great credit is to be gained by judicious and skilful management of the various stages, and by expert use of the catheter in difficult cases, when other practitioners, perhaps, after being foiled, have proposed operations alarming to the patient, and, in themselves, dangerous. In no disease are patients more grateful for relief, for in this the agony is often unbearable. Immediate abatement of all painful symptoms follows skilful and prompt measures; and the superior science of one man over others is made apparent to the most ignorant observer. In over-distended bladder from paralysis, the catheter can in general be passed without difficulty. It should be of a large size, and its introduction should be repeated as often as nature calls for relief, perhaps three or four times during the twenty-four hours, until the viscus regains its tone; and this, unless irrecoverably lost, will generally be restored in a few weeks at most. Repeated introduction of the instrument is here preferable to the retaining of it; the latter measure should always be avoided, unless absolutely indispensable, for a foreign body lodging in the urethra and neck of the bladder must always be a source of more or less irritation; and experience shows that the bladder sooner recovers its tone when the instrument is introduced only to draw off the urine, when the uncomfortable feelings of distention come on, than when it is constantly retained. The patient soon learns to pass the instrument himself, and thereby saves the surgeon from frequent attendance, whilst, at the same time, the bladder is opportunely relieved. Stimulants, as the tinctura lyttæ, given internally, with external friction, blistering, and the application of strychnine to the raw surface, may contribute towards restoration of the muscular power of the organ. Injections into the bladder have been recommended, but are both hurtful and inefficient. Enemata, containing turpentine, or other stimulating fluids, are of service.

In retention from inflamed urethra, the catheter should, if possible, be dispensed with. The introduction of it is excruciatingly painful, and will certainly aggravate the original affection. Blood should be abstracted both from the system and from the perineum; fomentations, with the warm bath or the hip bath, are afterwards to be employed. The retention is usually induced by hard exercise, or intemperance in living; these of course must be abandoned, and their opposites enjoined. Camphor alone, or combined with opium or hyoscyamus, is to be given internally in large doses. Opium may also be useful, administered in the form of an enema or suppository. If relief is not soon afforded by such soothing measures, the bladder must be relieved by the catheter; and if the surgeon be foiled in the introduction of this, as he ought not to be, the only resource is to puncture the bladder from the rectum — a harsh measure, to be sure, and one not indicative of surgical talent, but still preferable, in the eyes of both patient and practitioner, to death.

In retention from abscess in perineo, a little delay is allowable under the employment of palliatives, when the affection is acute. The abscess must be freely opened as soon as its seat is discovered; and until the evacuation of the matter, the use of the catheter should be deferred if possible. In cases of chronic abscess, the catheter must be used, and does no harm.

In retention from injury of the perineum, the catheter should be passed before the patient attempts to make water, and the instrument must be retained; thus extravasation of urine in addition to the blood into the cellular tissue will be avoided. If extravasation has occurred, the perineum, scrotum, or other parts, must be freely incised wherever the urine has been effused, in order to prevent the direful effects of lodgement of that fluid; and then the catheter should be passed and retained as in the former instance. If the surgeon be foiled in introducing an instrument, as he may be, and if the prostate be sound, the bladder must be relieved by puncture from the rectum.

Retention from stricture is, as already observed, the most difficult to manage. No time can be put off in bleeding or warm bathing, in giving internal remedies, or exhibiting enemata. The viscus is making violent exertions to relieve itself, and if these are left unassisted, or not rendered unnecessary, they may prove the patient's destruction. The system may be drained of blood, and the body parboiled, without the patient being relieved. The case requires immediate and decided practice; for whilst the surgeon is consulting about what is to be done, the urethra may give way, and the patient be lost. The discharge of a small quantity of urine may follow the introduction of small flexible bougies, up to the contracted point, but the bladder is not relieved. The throwing of cold water on the thighs may, in slight cases, induce such contraction of the expelling muscles as may overcome the resistance in the urethra, and this method has been had recourse to after failure with the catheter; but he must be a very poor surgeon indeed who is foiled, when such practice afterwards proves successful.

Immediate recourse must be had to the firm silver catheter, proportioned in size to the tightness of the stricture, and the difficulties afforded to its introduction must be overcome by skill and perseverance; it is no easy matter to pass the instrument in many cases, and particularly when ineffectual attempts have been made previously. By gentle insinuation, and perseverance in moderate pressure, properly directed, the obstacle can always be overcome, — and that without the infliction of any injury to the parts. I may here observe, that I have never yet been foiled in passing the catheter, though very many severe and difficult cases have fallen to my lot; in other words, I have never been obliged to abandon my attempts to obtain an exit for the urine by its natural passage, and, as a last resource, to mutilate and endanger a patient by making an unnatural aperture in his bladder. Yet circumstances may soon occur to me in which the introduction of an instrument along the urethra shall be impossible; no man, it has been said, can be always wise or always fortunate; and he who pretends to invariable success must be either a knave or a fool.

Should the surgeon fail in passing the catheter, the bladder must be relieved at all hazards; and if the prostate be sound puncture by the rectum may be performed. This is neither a difficult nor a dangerous operation, else it would not be so often resorted to; it does not require so much skill and management as does the passing of a catheter. Neither is it painful to the patient; the parts to be perforated are thin, there is scarcely any effusion of blood, and all is done in the dark. But it is an operation which should never be thought of, unless as a last and desperate remedy; it is one in which I have had no personal experience, though when a student of surgery I have seen it done a few times. The procedure gives temporary relief, but then the urethra still remains to be put into a proper condition; a man cannot always void his urine and excrement through one common cloaca. If the urethra be cleared, the recto-vesical aperture may soon close. After the bladder is relieved, the urethra may become quieter, and admit of an instrument being more easily passed; but it is of very great consequence to effect the introduction of a catheter at the first.

Rather than puncture the bladder, the stricture should be cut down upon, and an opening made into the dilated part of the urethra behind the obstruction. A firm silver catheter is passed down to the stricture, and retained there by an assistant; an incision in the line of the central raphe — supposing the constricted part to be in the perineal region — is made over the extremity of the instrument, the contracted part of the urethra is divided, and the catheter passed on into the bladder. Thus, even in the worst cases, the natural canal is at once established. In every instance of difficulty and complication, the catheter, however passed, should be retained for two or more days. The above is the only admissible mode of puncturing by the perineum. It has been proposed to reach the bladder from the perineum either by extensive incisions or by the random thrust of a long trocar; the latter mode is unscientific, the former is unnecessarily painful, serious, and difficult; both are dangerous, and to be avoided.

The symptoms of extravasation of urine have been already detailed. The practice must be bold, and adopted without hesitation or delay. No bulging or fluctuation in the perineum is to be waited for. It is to be kept in view, that the escape of urine into the open cellular tissue may occur in a case of bad stricture, from rapid ulceration or sloughing, without any of the dilated portion of the canal behind, induration or abscess having preceded it; in the greater number of cases the infiltration arises from the going way of the parietes of a cavity comunicating with the canal. Urinary infiltration thus supervenes upon urinous abscess. Extravasation can never be mistaken or overlooked by a man of any experience, and who is endowed with common observation. The effect and extent of the perineal fascia must be borne in mind; it diminishes or precludes — when the point at which the urethra has given way is interior to it — external appearance of the mischief, and by confining the deleterious fluid increases the infiltration internally. A free and deep incision holds out the only chance of relief; punctures or trifling scratches are worse than useless; neither is there any need of passing bougies or catheters, or of puncturing the bladder.

The following instructive case may be briefly detailed. A man applied at a public hospital for relief, with a large swelling in the hypogastrium, occasioned by extensive infiltration of urine into the cellular tissue of the abdominal parietes. The tumour was mistaken for distention of the bladder, and a long trocar was plunged in above the pubes without a drop of urine escaping. The patient died during the night. The bladder was found contracted, and the external cellular tissue of the abdomen full of urine, from the giving way of the urethra.

When judicious and energetic practice is adopted without delay, patients often make wonderful recoveries. The following may serve as an example : — An elderly man laboured under retention, and his bladder became distended to a very great degree ; attempts had been made to relieve him, but proved unsuccessful. A catheter was passed, and retained for three days. During my absence in the country retention again occurred, followed by extravasation. On my return I found him insensible, but immediately turned him round in bed, and opened the perineum freely, giving vent to fetid urine, sloughs, and matter. Next day he was delirious, and knew no one ; he hiccoughed, and had cold extremities ; "he fumbled with the sheets," and "his nose was as sharp as a pen." A physician in attendance, well acquainted with disease, declared that he could not live six hours. But the urine had a free exit, the hiccough ceased on the exhibition of spiritus ammoniæ aromaticus, and wine and brandy were poured into him liberally, the only favourable symptom being, that he still retained the power of swallowing — when that is lost, all is generally lost. He took soup along with the stimulants readily and greedily, and, to the astonishment of every one, recovered rapidly ; afterwards the stricture was got rid of, and restoration to perfect health completed. Many cases of similar import might be related, all showing the great danger of extravasation of urine, and the advantage of early and decided treatment. I once also witnessed, in the Royal Infirmary, an unexpected recovery from extravasation into the corpus spongiosum urethræ. This occurrence is always attended with most imminent risk ; and is generally the result of retention from stricture. The urine escapes into the bulb, or anterior to it. Alarming constitutional symptoms quickly supervene ; rapid sinking is threatened. The whole penis, scrotum, and perineum are swoln, but the swelling is hard, and most marked in the glans and along the course of the urethra. The glans blackens, unhealthy abscesses form in the spongy body, and before these give way, or at least before the sloughs begin to separate, the patient usually perishes. The man to whom I allude, however, recovered, retaining a part of the penis, as well as a considerable portion of its integuments ; the rest sloughed and were discharged.

In regard to retention from swelling at the neck of the bladder, it may be observed, that spasm of that part of the viscus has been, by some, considered as a cause of the affection ; it is not easy to explain or understand how this should occur, and such an idea is a bad one for him to entertain who enters on the treatment of the disease. The capacity of the bladder varies much in cases of enlarged prostate ;

in general the organ bears a good deal of distention, and the urgent symptoms do not appear rapidly. Nevertheless, it is the duty of the surgeon, immediately on being called, to relieve the bladder. When the prostate is very large, and retention has continued long, it is impossible to reach the cavity by a common catheter. Those who employ this instrument in such cases are often much puzzled; they continue long in their fruitless endeavours, and, from rashness, generally produce a discharge of much blood, but no urine; they then become alarmed on finding the instrument always filled with coagulum, and suppose that blood has been effused into the bladder, and that the symptoms of retention have been thus introduced. A catheter is to be used, which is two or three inches longer than the common one, possessing a larger curve, of such a size as to admit of being passed easily, and not so small as to render it liable to interruption from entanglement in the lacunæ of the urethra. The posterior part of the urethra is elongated to no slight extent by the enlargement of the prostate, and, besides, the whole canal is stretched by the distended bladder rising high in the abdomen. In short, the bladder is farther away from the surgeon than it is in other cases of retention, and he requires an instrument proportionally long in order to reach it. No time is to be put off. A cautious and persevering endeavour must be made to bring away the urine by the natural passage. Force is prejudicial and unnecessary. It is true that the projecting third lobe of the prostate has not unfrequently been perforated by the catheter, and no unpleasant consequences have resulted, the urine continuing to flow, perhaps freely, through the artificial opening there; but still it is always an injury, often an unnecessary injury, and as such to be avoided. The catheter is to be passed steadily on till it approaches the prostatic region; it is then to be guided by the forefinger of the left hand introduced into the rectum, and when the point is lost in passing through the gland, the instrument is carefully carried forward by depressing the handle, and, if long enough, it will infallibly reach the urine and relieve the bladder. It must, indeed, be a very extraordinary case in which the bladder cannot be reached with the catheter.

When enlargement of the prostate, whether of the whole gland or principally of the third lobe, presents an insuperable obstacle to the passage of the catheter, and when the surgeon has taken care to assure himself that such is the case, I conceive that he ought to perforate the gland in the direction of the natural course of the urethra, not with the catheter, but with an instrument better adapted for the purpose — a long canula, or catheter with open end, very slightly curved towards the extremity, provided with two wires, one blunt and bulbous at the extremity, the other pointed as a trocar, both made so as to project a short way beyond the end of the canula. The canula is passed on to the resisting body, its orifice occupied by the bulbous wire, which is then withdrawn, and its place supplied by the trocar, the instrument being held steadily in the proper direction. The trocar, or stilet, is pushed forwards along with the canula; the former is then withdrawn, and the latter retained. This proceeding I consider quite safe in the hands of an experienced surgeon, one well acquainted with the urinary passages — but not otherwise. It is in every way preferable to puncture of the bladder above the pubes, to puncture behind the prostate, or to puncture of the prostate along with wound of the rectum.

As before noticed, I never have had occasion to puncture the bladder but once — and that was above the pubes, and for an unusual affection of the bladder, the particulars of which have been already detailed. The result of the experience of several eminent surgeons, both in this country and abroad, is similar.

Elastic gum catheters have been recommended in this affection, and it is said that after the instrument has been passed to the prostatic region, its entrance into the bladder is facilitated by gently withdrawing the stilet, the point of the catheter being thereby curved upwards, and, as it were, lifted over any central projection of the prostate that may impede its straightforward introduction. But according to my experience, this instrument is far inferior to the firm and long silver catheter.

In all cases of retention when the urine cannot be brought away per vias naturales, and when no farther assistance or advice can be procured immediately, the surgeon should puncture the bladder rather than leave the patient to his fate; and the operation should be performed early. He must not temporise till all chance of recovery has gone by. By not operating till late, in this or any other disease, when by the delay no reasonable chance of saving the patient remains, our department of the profession is brought into discredit and contempt. Delay is more dangerous than even the worst mode of making and opening into the bladder; and while life exists, the patient should have his chance. Some defer extreme measures from day to day, either from hesitation or from a false hope that matters may ultimately change for the better, but the delay of one hour is in many cases most hazardous. In retention from disease of the prostate extravasation of urine is more dangerous — more certainly fatal — than in other circumstances. Here a part of the vesical parietes gives way by sloughing, and the fluid is effused within the ilio-vesical fascia; in other cases the extravasation is usually beyond that fascia, and beneath the fascia of the perineum.

Puncture by the Rectum is, in cases of enlarged prostate, inadmissible and highly dangerous; the operator must either perforate the gland, or enter the cavity of the abdomen. Even in the healthy state of parts, there is very little space between the posterior part of the prostate and the reflection of the peritoneum. The operator having ascertained that the prostate is sound, and the rectum empty, introduces the fore and middle fingers of the left hand into the bowel, and along these passes a trocar and canula from four to five inches in length, of moderate calibre, and of a curve rather greater than that of the sacrum. He places the point of this instrument on the part to be perforated, and fixes it there, the point of the trocar being hitherto withdrawn within the canula; the stilet is then protruded, and both carried onwards into the bladder. The part to be perforated is immediately behind the prostate and in the mesial line.

Puncture above the Pubes is easily enough performed when the bladder is capacious, but it is at best a dangerous operation. The wound is made through loose cellular tissue; urinary extravasation into that tissue is apt to occur, and often proves fatal. If the bowels are inflamed, or evince a tendency towards inflammatory action, the danger is increased, for a formidable wound is made in the immediate vicinity of the bowels. The operation has been resorted to when the catheter might have been passed without much difficulty; this statement may appear harsh, but it is too true, and can be borne out by indisputable facts. It is brought forward more as a caution to the young than as a reflection on the senior members of the profession. Some patients have recovered from the operation, and lived in misery for months and years, passing their urine through a canula retained in the wound. An incision is made above the symphysis pubis, in the mesial line, dividing the integuments and cellular tissue, to the extent of from one to two inches; on thus exposing the coats of the bladder, a flat trocar with a canula is pushed into the cavity of the viscus, at the lower part of the wound; the trocar is withdrawn, and the urine evacuated.

The treatment of enlarged prostate is palliative — attention to the general health, the occasional administration of anodyne suppositories or enemata, prevention of accumulation in the lower bowels, either by gentle laxatives or the throwing up of bland fluid, and the avoiding as far as possible all sources to excitement, of mind as well as body. The radical cure, it has been said, is extirpation of the gland, but the cool proposal of such an operation would indicate either ignorance, or dereliction of principle, or mental obliquity, or all combined.

In retention from effusion of blood into the cavity of the bladder, a long catheter will sometimes evacuate the urine, and after some time also the blood; for the latter, though at first coagulated, ultimately becomes dissolved in the urine, and passes off along with it, even through a catheter of no very large calibre. Should this fail, and the symptoms continue urgent, an exhausting syringe should be employed, well adapted to the extremity of the catheter. After the urine has been thus evacuated, should a suspicion remain of coagula being still in the bladder, tepid water may be injected with the view of promoting the breaking down of the clots, and then the exhaustion may be repeated.

Incontinence of Urine, as already observed, is a common result of distention of the bladder and of stricture. But it also occurs as a primary affection, particularly in young people, from irritability of the posterior part of the urethra not suffering the urine to accumulate within the bladder as in ordinary circumstances. It is sometimes removed by the application of a blister to the perineum, and by the patient attending to empty the bladder at intervals during the night. Attention to the state of the bowels is necessary in such cases. The clearing them of worms or sordes, and the exhibition of tonics is sometimes also useful. Children, and even mothers, sometimes have recourse to a more effectual method, the application of a tight ligature round the penis. But of the folly and danger of such practice, the following may serve as an example. A. R., when 8 years old, passed a brass curtain-ring over his penis to prevent incontinence of urine during the night, and thereby escape chastisement, to which he had been frequently subjected. Great swelling soon took place round the ring, and he was unable to remove the jugum. He experienced much pain and difficulty in voiding his urine; the integuments under the ring gradually ulcerated, the ring appeared to sink into the substance of the penis, and the swelling subsided. The integuments met and adhered, the foreign body was concealed, and all uneasiness soon ceased. The penis performed well all that was required of it; the urine passed easily, and after a while he became the father of a fine family. When between fifty and sixty years of age, he applied to me. For some years previously difficulty in making water had been coming on, and frequent desire to pass it in the night-time rendered him very uncomfortable. He was under the necessity of having a vessel constantly in bed, and was generally disturbed every half hour. The penis had become very unserviceable, and he was now anxious to have the ring removed. A broad hard substance was felt surrounding the penis, close to the symphysis; an incision was made into the urethra at that part, and a calculus easily extracted. The uneasy symptoms quickly disappeared, and the patient recovered with a small fistula at the incised part, which could have been removed without difficulty, had not all treatment been obstinately resisted. The calculus resembled a prune in size, of a crescentic form, with one of the apices detached, and was apparently composed of uric acid, coated with the ammoniaco-magnesian phosphate. On making a section of it, about two-thirds of the brass curtain-ring, partially decomposed, were found firmly impacted in the centre. It would appear that a portion of the ring had speedily made its way into the urethra, had been acted upon and washed away by the urine; while the remainder, coming more gradually in contact with that fluid, had become incrusted with deposit, and formed the nucleus of the calculus. It is strange that the penis should have been efficient, — that the erectile tissue should have remained pervious — after having been cut completely through near the symphysis.

Of Gonorrhœa Præputialis vel spuria. — By this term is understood discharge of puriform matter from the lining membrane of the prepuce, and from the surface of the glans, accompanied with an itching and smarting sensation. The affection may arise from mere inattention to cleanliness, the natural secretion being allowed to collect and deteriorate; or from the application of acrid matter, gonorrhœal, or leucorrhœal. It often attends discharge from the urethra, and is usually met with in those who, from the natural tightness of the prepuce, uncover the glans with difficulty, if at all. It may occur without impure connexion; mucous discharge accumulates, becomes acrid from stagnation, and is washed away by profuse secretion of puriform matter; the parts then become quiet, and resume their healthy functions, but are apt from slight causes to be again the seat of discharge. Generally, the surfaces of the prepuce and glans are relaxed and turgid, but there is no breach of continuity; in neglected cases there is superficial patchy ulceration, and sometimes a deep and sloughing sore. The matter is often confined by tightness of the præputial orifice, and mischief thereby occasioned to the glans; a large purulent collection forms, and, if the case is neglected, ulceration takes place, either of the glans or of the prepuce, or of both; the latter becomes thin, and at length gives way; the aperture thus formed extends, and occasionally is of such a size as to admit of protrusion of the glans. Œdematous swelling generally takes place to a great extent in such cases. The glands of the groin sometimes swell, and through inattention may suppurate. The absorbents of the penis may also become turgid and painful. Tenderness of the glands and prepuce often exists, in a greater or less degree, for years; in such circumstances the affection may be termed gleet of the prepuce, and is usually the consequence of irritable urethra.

The treatment consists in cleanliness and rest, applying astringent washes to the parts, and suspending the organ. When swelling of the prepuce or inflammation of the lymphatics is threatened, constant rest must be enjoined. In obstinate cases, disease of the urethra is to be suspected as the cause, and the state of that canal should therefore be ascertained; if derangement of structure or function is detected, then means must be forthwith adopted for its removal, the applications to the prepuce and glans being at the same time not neglected. Mercury can be of no use.

Phymosis and Paraphymosis are often connected with gonorrhœa of the prepuce, or of the urethra. The edge of the prepuce may be rendered tight by inflammation, swelling from effusion, or cicatrisation of sores; the tightness also attends irritability of the urethra, particularly in young subjects; often it is congenital. The affection is termed *Phymosis* when the prepuce occupies its natural relative situation, but cannot be drawn back so as to uncover the glans. The contraction exists in various degrees; sometimes the orifice is so tight that the flow of urine is obstructed, the præputial cavity becoming swelled and distended every time the patient attempts to make water. In other instances the uninjected glans can be exposed either in part or entirely, though with difficulty. In consequence of the præputial cavity being frequently filled with urine, in cases of great contraction, urinary concretions have even formed or been detained there or in the orifice of the urethra, giving rise to very annoying, and sometimes alarming, symptoms. In consequence of Phymosis, the urethra and bladder may become diseased. It is often attended with profuse puriform discharge, with sores of different kinds, or with warty excrescences on the glans and prepuce; sometimes the whole surface is completely covered with granulated prominences of various sizes, some large, but the majority small, some broadly attached, others suspended by narrow necks; all generally furnish discharge of thin acrid matter. Adhesion may take place between the raw surfaces of the prepuce and glans, provided the parts be not frequently displaced for the purpose of ablution.

Paraphymosis arises from the same state of the orifice of the prepuce as the former affection, only the parts are in different relations to each other. In phymosis the prepuce covers the glans, the tight part is anterior to it; in paraphymosis the prepuce is reflected over the glans, the tight part acts as a ligature round the penis behind the glans, and such swelling speedily arises in consequence of the constriction so as to prevent reduction. The glans and lining membrane of the prepuce swell anteriorly to the stricture, the integuments of the penis swell behind, and the stricture is depressed and concealed between. The cellular tissue there is necessarily very loose, so as to admit of free motion and change of relative position, and consequently the engorgement is often very great. The infiltration is at first serous, and the swelling is easily compressed; but, from continuance of the inflammatory action, lymph is effused, and becomes organised, and the turgescence is more solid and unyielding. When the stricture is very tight, the patient cachectic and irregular in his mode of life, and the case injudiciously or inertly treated, sloughing takes place rapidly, or phagedenic ulceration occurs anterior to the stricture. But in most cases the prepuce is not so tight as to cause complete strangulation, yet obstructs the flow of blood sufficiently to induce swelling of the included parts, breach of surface more or less extensive, and an unhealthy appearance of the ulceration. The ulceration is generally in the neighbourhood of the stricture, at first limited and superficial, but increasing both in depth and extent so long as the cause remains. The stricture is not situated anteriorly to the swelling, as has been sometimes supposed, but near its middle — where the tight orifice of the prepuce grasps the penis, and causes a depression in the swelling. On separating the anterior and posterior tumours, the stricture is readily exposed, though previously effectually concealed.

In slight cases of phymosis, the orifice may be dilated by frequent fomentation, and perseverance in withdrawing the prepuce as far as possible. When ulceration or secretion of matter has occurred, astringent injections, at first mild, and gradually strengthened, should be frequently thrown into the præputial cavity. Suspension of the penis should be enjoined, along with rest — of the whole body, as well as of the affected organ in particular. When much inflammation exists, antiphlogistic remedies must be put in force, followed by fomentations. In bad cases, the prepuce must be divided in order to expose the seat of morbid secretions, of ulceration, and vegetations. The preferable situation for incision is close by the side of the frænum, much less deformity ensuing than when the prepuce is divided either laterally or in front. The flaps are at first loose and flabby, but shrink as the œdematous swelling subsides. A straight director is introduced within the præputial orifice — the groove pointing downwards — and passed down to the reflection, close to the frænum; a sharp-pointed curved bistoury is slid along the groove till it also reaches the reflection; by raising the handle and pushing it forwards, the integuments are transfixed there, and withdrawal of the knife by a rapid sweep completes the incision. Care must be taken not to pass the director into the urethra instead of into the præputial cavity. It is very seldom that ligature is required to arrest bleeding. Should the cellular tissue of the divided part not have been the seat of solid effusion, the integument and the lining membrane of the prepuce separate, leaving a large raw surface; and to prevent this a small suture should be passed between the membrane and skin on each side of the wound; these may be withdrawn on the second or third day, the cellular tissue having then become consolidated, so as not to admit of retraction. A warm bread poultice, or water dressing, is the best application for the first few days; afterwards healing of the cut surfaces may be promoted by the application of a gently stimulating lotion. Should œdema of the prepuce remain, this may soon be effaced by bandaging. By this operation sufficient space is obtained for uncovering the glans, under any circumstances; and besides, to this part of the organ is still preserved its natural investment, not in the least curtailed either in size or in efficiency — the glans can be uncovered and covered at will; whereas by any other mode of incision the unseemly flaps always fall away, leaving the greater part of the glans constantly uncovered, and placing the patient, if not in a worse, at least in the same predicament, as if he had been subjected to regular circumcision.

There is danger in allowing the state of phymosis to exist long; it has been already observed, that this condition of the parts predisposes to ulceration, vegetations, and morbid secretions; but besides, experience has shown, that very many cases of cancer of the penis are attributable to phymosis, either congenital, or of long duration. In all cases, when the orifice of the prepuce is so tight as not to admit of exposure of the glans, the operation is expedient, the existing state of parts being very inconvenient; but it becomes a matter of absolute necessity, when there are extensive sores on the prepuce or glans, when there is much tumefaction or hardening of the parts, when urinary concretions lodge in the præputial cavity, or in the orifice of the urethra, when vegetations or warts form on the glans, and when the præputial orifice is so contracted as seriously to impede the flow of urine.

In paraphymosis there is a necessity for early interference, in order to save the organ; indeed active and decided measures are as imperiously called for here, as in the case of strangulated hernia: and it ought to be remembered that the organ is one of importance, and that its loss would render most people very miserable. To attempt relaxation by fomentations, and such like, is absolute folly; the stricture cannot yield to such remedies; and, from increase of swelling, strangulation will become more and more complete. Cold, too, is incapable of reducing the swelling; cold, or astringents, cannot possibly diminish the size of the vessels, whilst return of the blood in them is prevented by tight stricture; and so long as the stricture remains, the serous effusion cannot subside, but will increase. Besides, the application of cold may hasten the occurrence of gangrene, inasmuch as it tends to diminish the power of parts which are already in a weakly condition. The parts must be instantly replaced. With the fingers of the right hand, the surgeon grasps the glans, and by firm and continued pressure diminishes its volume, whilst with the left he endeavours, by steady pulling, to reflect the swollen prepuce over the glans, which he is at the same time pushing back, as well as lessening. By uniformity and perseverance in these manipulations, more than by any force, replacement will often be accomplished.

He will be able to judge, from the duration of the disease, and from the appearance and feel of the parts, whether simple reduction, that is, without having recourse to the knife, be practicable or not. In some cases, particularly when gangrene is imminent, and when the ulceration is extensive, there is danger of materially injuring the glans, if attempts at reduction are injudiciously persevered in. When he is foiled in reduction, or deems the attempting of it imprudent, the stricture must be divided; and in this simple operation great errors are often committed from ignorance of the nature of the disease, and of the relative situation of the parts. It is necessary to divide only the edge of the prepuce, which, from being reflected, alone composes the stricture. The anterior and posterior swellings are to be separated as far as possible, and in the very bottom of the depression between them the stricture is exposed; a slight incision, a scratch, through this, either with the point of a bistoury, or with a lancet, is sufficient; the tight edge of the prepuce — the only part in fault — is divided, and then, by the process already detailed, reduction can be readily effected. After reduction, a minute notch in the extreme edge of the prepuce is the only deformity visible, except the swelling. But if, from ignorance of the true seat of the stricture, extensive incisions have been made, pretty much at random, the organ may be considerably disfigured — and that unnecessarily. By fomentations, rest, and low diet, the effusion will be dissipated in a very few days. Reduction is difficult when the contraction has continued for some time, and the tissues have become glued together by effused lymph.

Malignant ulcer, with induration of the surrounding parts, and contamination of the lymphatics, occurs occasionally on the glans penis, or on the lining membrane of the prepuce. As before observed, it is most frequently met with in those who have laboured under congenital phymosis; in that state of the organ, its extremity is apt to inflame, swell, and ulcerate, in consequence of accumulation and acrimony of the secretions from the membrane of the prepuce; indolent swellings form in the groin; and in one case, I recollect, these assumed a malignant action, a frightful ulcer formed, and the patient was destroyed, after division of the prepuce, and after the ulceration on it had been long healed, and the part had apparently become quite sound. Early removal of the diseased part, by incision wide of the indurated and altered structure surrounding the ulcer, is the only means of saving the patient, of preventing glandular inguinal tumour, ulceration of it, hemorrhage, hectic, and death. When the prepuce solely is involved, removal of this is sufficient, either entirely or in part, as circumstances may demand. When the glands and coverings, as also the body of the organ, are involved, amputation is to be performed, provided the lymphatics still appear unaffected. In this operation the integuments must be freely removed, otherwise the cut orifice of the urethra will be obstructed by their puckering and contraction during cicatrisation of the wound. With this view, the skin is drawn forwards and stretched by the left hand, and then with one sweep of a long knife a transverse incision is made at once through all the parts composing the organ. Two or three vessels by the side of the septum may require ligatures. The skin retracts considerably, leaving the cut surface free; the wound granulates, contracts, and cicatrises. It is advisable to cut the urethra a little longer than the body of the organ. If diminution in the canal of the urethra be threatened during the cicatrisation, it is to be obviated by the occasional use of a short conical bougie.

Imperfections about the orifice of the urethra are by no means uncommon. Often there is a mere vestige of the orifice of the urethra in the natural situation, the opening being situated half an inch or a whole inch behind, and on the lower part — *Hypospadias;* in such cases the prepuce is generally short.

Sometimes the urethra is deficient to a great extent, terminating immediately before the scrotum, or even behind it. A child had passed no water thirty hours after its birth. The bladder was distended. The genital organs were imperfect; the urethra was wanting, and the penis was diminutive and abnormal. A small trocar was passed from the vestige of the orifice onwards, in the proper course, guided by the finger in the rectum. The urethra seemed to have terminated at the bulb; the canula reached this, and was retained for twenty-four hours. Afterwards the urine passed readily through the canal, partly natural, but principally artificial, and the power of retaining it became perfect.

In adults the hypospadias is inconvenient; the orifice is often contracted, and the whole parts are irritable; and the ejaculation of the seminal fluid is unsatisfactory to the parties concerned. The deficiency may be repaired in some measure, when there is abundance of skin to spare, but no rules can be laid down for such irregular operations.

Imperfection of the urethra anteriorly, on the dorsum, is rare — *Epispadias.* The following is rather a remarkable instance: — The man was aged 26, robust and healthy. The whole extent of the urethra anterior to the pubes was exposed superiorly, there being a wide fissure through the corpora cavernosa and glans. The penis was retracted considerably, so that the posterior part of the fissure lay beneath the symphysis pubis. The numerous lacunæ of the urethra were beautifully distinct, and the mucous membrane was seen covered by their secretion. When the patient made water, the urine, after emerging from beneath the pubes, divided into numerous small streams, some of which spread over the side of the penis, while others passed along the exposed urethra. The callous margins of the fissure, formed by the corpora cavernosa and glans, were carefully pared, and, a catheter having been introduced, the raw surfaces were retained in apposition by suture. The wound healed perfectly, almost entirely by the first intention; and the organ both looked well and proved efficient. The malformation was congenital, and was considered by the patient as analogous to harelip; but the story related to account for it in consequence of an impression made in his mother's imagination, was not very plausible.

The disease of the external parts of the male genital organs, commonly called *Chimney-sweeper's Cancer,* is one of a formidable and intractable nature, but fortunately not very often met with. The scrotum is the part usually attacked. A wart forms, generally at the lower part, assumes an irritable appearance, and quickly degenerates into open ulceration of a malignant character. The ulcer extends rapidly, consuming the neighbouring integument, and involving the testicle and other subjacent parts in induration and enlargement. The induration extends along the spermatic chord, and the lymphatics participate in the diseased action at an early period. The discharge from the sore is acrid, sanious, and possessed of much fetor; sometimes fungi protrude, but more commonly the surface is excavated and smooth. Not unfrequently the skin surrounding the ulcer is studded, to a considerable extent, with numerous clusters of warts, of an unhealthy and angry aspect. A very aggravated specimen of the disease is here represented. The general health is soon undermined, and the disease advances from bad to worse with the usual certainty and rapidity of malignant action. It seldom occurs till after the age of thirty or forty; and though most frequent in chimney-sweeps, is not peculiar to them. No treatment can be expected to arrest its progress at an advanced stage; the only opportunity of saving the patient is at the commencement of the disease, when the affected part is small, and before the lymphatics have become involved. Local application and internal remedies are not to be trusted to; in the early stage the parts may be excised. An incision is made wide around the wart or ulcer, and the included parts are dissected away to a considerable depth. When the testicle has become affected, the chance of success is much diminished; but still, if the inguinal glands appear sound, and the chord tolerably free, castration is to be performed as the last, though desperate, means of eradicating the disease.

By *Hydrocele* is meant a tumour caused by accumulation of fluid either in the chord or within the cavity of the tunica vaginalis testis. It has been divided into diffused and encysted. By the former term is understood effusion and accumulation of serum in the cellular tissue, the cells gradually dilating to accommodate the increasing fluid, and ultimately becoming converted into vesicles of large size: the parts around are thickened and condensed. This affection is very rarely a local one, but almost uniformly combined with and forming a part of anasarca arising from constitutional causes. When the swelling proves troublesome, it may be diminished by drawing off the fluid through one or several punctures; in the chronic form of the disease free incision is attended with risk, and is besides unnecessary.

The scrotum is sometimes distended rapidly by effusion of serum often of a putrescent and acrid nature. This affection supervenes upon ulcers or sinuses in the groin, perineum, or neighbourhood of the anus, in patients out of health. It occurs also occasionally as a consequence of injury of the genital organs, or interferes with bad strictures, without any disease of these parts, and without the least cause for the suspicion of urine having escaped into the cellular tissue. This, together with the skin, is destroyed, and the testicles exposed. The only chance of saving the tissues consists in early and free incision of the most dependent part of the swelling, generally the inferior and posterior. Some cases and remarks on this subject will be found in the *Medico-Chirurgical Transactions*, vol. xxii., p. 288.

Encysted hydrocele of the chord occurs in children more frequently than in adults. The fluid is thin and clear, and contained in a distinct cyst, of a smooth, shining, serous appearance internally; this cyst may be either an unobliterated portion of the congenital spermatic process, or composed of thickened and condensed cellular tissue, strengthened exteriorly by the expansion of the cremaster muscle. The tumour is seldom large, usually of an oval form, and situated nearly midway between the testicle and groin; causing no pain, but proving inconvenient simply from its bulk and situation; fluctuating, and sometimes partially diaphanous; evidently circumscribed, the chord both above and below being natural to both sight and touch; not altered by change of posture or by muscular exertion. Sometimes it encroaches both on the groin and on the testicle, but even then attentive manipulation readily distinguishes it from swellings connected with these parts. Discharge of the fluid by means of a small trocar and canula, not only dissipates the swelling, but often effects a permanent cure, particularly in young persons — the cyst either ceasing to exercise a secretory function, or becoming obliterated. If reaccumulation take place, the treatment is to be conducted on the same principles as in hydrocele of the vaginal coat.

Hydrocele of the tunica vaginalis is exceedingly common, particularly amongst labouring people, and occurs apparently with equal frequency at all ages. It is a gradual accumulation within the tunica vaginalis of a fluid partaking more or less of the serous character, furnished by the exhalants of that membrane, — but whether from excessive secretion or deficient absorption, it is difficult to determine. It is probable that the accumulation is the result of excited action in the part, for its origin is most frequently attributable to external injury — blows or bruises, followed by rapid swelling, which, after a time, subsides, leaving perhaps some enlargement of the testicle, or of the more superficial tissues, and succeeded by the gradual appearance of the disease in question. Sometimes it is attributed to powerful and habitual muscular exertion, as in blowing wind instruments, lifting heavy weights, &c.; and perhaps the impediment to the venous return, so produced, may be the cause of the effusion. The accumulation, as already stated, is gradual, and consequently the formation of the swelling is proportionally slow. It commences at the lower part of the scrotum, and by degrees ascends, at first globular, afterwards of a pyriform shape; after it has attained a considerable size, the testicle cannot be felt in its usual situation, for it is now placed not at the bottom of the bag but towards its middle and posterior aspect, and if the tumour be tense it can scarcely be felt at all. The raphe is displaced to the opposite side, the usual puckering of the scrotum has disappeared, and the tumour feels light in proportion to its size. On manipulation it is found yielding and elastic, and in all ordinary cases a distinct fluctuation is communicated to the fingers during alternate pressure. And by using the hand as a shade, the rays of light are made to permeate the swelling, rendering it more or less transparent according to the thickness and density of the covering, and the hue of the contained fluid. It is seldom that the distention of the vaginal coat is to such an extent as to reach the groin, consequently the spermatic chord is felt to be free, as also the inguinal aperture; and even when the swelling does reach so high, the upper part is the least tense, permitting displacement of the fluid and distinct perception of the chord. The patient complains of a sense of dragging and weight in the parts, and of uneasiness and inconvenience during exertion, but seldom of pain. When large, the tumour is necessarily covered by borrowed integument, often so as almost entirely to conceal the penis. In many cases the testicle is increased in size and indurated, and sometimes this enlargement forms a considerable part of the swelling. Occasionally the spermatic veins are varicose; and this has been, by some, considered one of the causes of the disease. Hydrocele is occasionally complicated by the presence of hernia, when a careful examination must be instituted in order to understand the exact share each disease has in the production of the swelling. In cases of very slow increase, and in persons of advanced age, the vaginal coat and its investments are not unfrequently much thickened, so as to obscure the sense of fluctuation, and destroy the transparency of the tumour. Sometimes deposit of earthy matter takes place between the layers of the membrane, rendering it hard, rigid, and in a measure osseous; in such cases cholesterine has been found in the contained fluid; sometimes the cavity is intersected by membranous filaments, delicate and reticulated; sometimes complete septa subdivide it into several compartments. The fluid is generally thin, albuminous, and of a straw colour; in some cases paler, and coagulating on cooling, being gelatinous; in others of a dark colour, probably from admixture of blood.

The treatment is either palliative or radical. The former consists in evacuating the fluid from time to time, according as the feelings of the patient demand it; in children this simple tapping is often successful in preventing return of the disease. But here the disease often enough disappears under the use of a stimulating lotion, as a strong solution of the muriate of ammonia.

The swelling is grasped from behind by the left hand, and compressed so as to render the middle and fore part tense and prominent; into this a trocar and canula are plunged, piercing the coverings in a perpendicular direction, and then inclining the canula upwards, the stilet having been partially withdrawn, so as to avoid wounding the testicle. The venous branches apparent on the surface must be of course avoided. When fairly passed within the cavity, the trocar is withdrawn entirely, and the fluid escapes through the canula — gentle pressure being employed towards the conclusion.

The wound usually heals in a few hours. Various means of radical cure have been proposed — incision, seton, caustic, and the injection of stimulating fluids. Incision and the seton are now abandoned, and do not require notice. The application of caustic perhaps may prove efficient in children when tapping has failed, and in youths; an aperture is thus made, through which the fluid escapes, and at the same time considerable excitement is induced, which may prevent reproduction. I at one period made trial of it in several instances, and generally with success; but am now inclined to avoid it, having more than once experienced much difficulty in keeping within moderate bounds the inflammatory action which succeeded its application. Injection is now generally practised; and if carefully performed, it is unattended with risk, and is almost invariably successful. Various fluids may be employed — cold water, wine, wine and water, spirits, a solution of the sulphate of zinc, &c. I have generally used pure port wine; and have scarcely ever seen its effects either excessive or deficient. I can remember very few cases in which the disease returned after this injection. Having ascertained that the testicle is sound, or but slightly enlarged — for injection of the tunica vaginalis is incompatible with diseased testicle — the fluid is drawn off by means of a round trocar. The canula is left in the wound, and to it is adapted the nozzle of a brass stop-cock attached to a small elastic bottle. By means of these instruments the wine is injected in sufficient quantity to distend the tunic moderately, taking care that the extremity of the canula is completely within the cavity, otherwise the cellular tissue will be injected, and violent inflammation ensue, terminating in unhealthy suppuration and sloughing. By turning the cock, the wine is retained until the patient begin to feel pain shooting upwards to the loins, when it is to be evacuated. He may not feel any uneasiness, however, and then it will be necessary to draw off the fluid and inject a fresh quantity. If this, too, fail, a more stimulating fluid must be used, a solution of sulphate of zinc, spirits and water, or pure ardent spirits. It is supposed that this treatment is effectual by inducing adhesive inflammation, and obliteration of the cavity by adhesion of the tunica vaginalis to the tunica albuginea; but this does not by any means frequently happen. There may in some cases be a little lymph deposited, but not in sufficient quantity to cause adhesion. The excitement following injection seems to change the action in the parts without altering their structure or relation — to reëstablish the healthy balance between the exhalants and absorbents. Its first effect is to produce increase of swelling from fresh effusion into the cavity of the tunica vaginalis, accompanied with redness of the integument and considerable pain — sometimes with slight fever. This fluid, however, is quickly absorbed — usually in from four to six days — the swelling subsides, as also the pain, and the patient remains free of the disease. Whilst this salutary action is in progress, the recumbent posture must be strictly enjoined, along with low diet and suspension of the organ; and sometimes, though rarely, it may be necessary to have recourse to more active means to moderate inflammation. Should the excitement appear insufficient after a day or two, the surfaces may be rubbed against each other with the fingers, and gently squeezed, or the patient may be directed to walk about occasionally through his room until pain is felt. If the disease return, as need scarcely be dreaded, injection is to be repeated, either again with wine, or with a more potent fluid.*

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* The principal objection to this method is, that it is not always successful, and that it requires, in some cases, to be repeated again and again before a sufficient amount of adhesive action is induced to obliterate the vaginal sac. Moreover, by carelessness on the part of the surgeon, the canula may slip out of the vaginal sac, and so allow the fluid to pass into the cellular substance of the scrotum, where, if it be not speedily evacuated by free incisions, it is sure to occasion gangrene. But this is not all. The operation, even when well performed, is sometimes followed by violent inflammation and suppuration; in one instance, indeed, I knew it to be productive of tetanus. The patient, a stout, robust mechanic, about twenty-six years of age, whom I saw twice in consultation, was doing apparently well during the first eight days after the operation; when, owing to exposure to cold, the symptoms of the disease in question manifested themselves, and in less than twenty-four hours the man expired. Upon examination after death, the vaginal tunic was found to be considerably thickened, and its cavity to contain several ounces of sero-sanguinolent fluid, intermixed with a small quantity of unhealthy-looking pus. No adhesions had taken place between the opposite sides of the sac. A case of a similar kind is alluded to by Sir George Ballinggall, in his "Outlines of Military Surgery."

The operation by injection has, I know, many advocates, both in this country and in Europe; and, when well executed, is generally unattended with risk, if not always successful. The fact, however, that it may be followed by serious mischief, with occasional loss of life, should be sufficient to deter the practitioner from resorting to it, more especially when we reflect that we are in possession of another remedy, not only entirely devoid of danger, but always, so far as my observation extends, most effective. This remedy is the seton, which I have been in the habit of employing, in repeated instances, for some years past, and from which I have never experienced any other than the most happy results. The operation is perfectly simple, the amount of inflammation produced by the presence of the foreign body may be easily regulated, and there is no danger of sloughing of the scrotum, much less of the development of tetanus, or other mischief.

In performing the operation, a large round trocar is introduced at the usual place, and after the fluid has been thoroughly evacuated, the instrument is again conveyed along the canula to the upper and fore part of the scrotum, for the purpose of effecting a counter-opening, which should be from an inch and a half to two inches from the first. The trocar is now withdrawn, when an eyed-probe, armed with a skein of silk or piece of tape, is passed along the tube, upon removing which the operation is completed. The seton need seldom be retained longer than four or five days; during which period, as

The term *Cirsocele* is applied to varix of the spermatic veins. The affection seldom extends to the inguinal aperture, and is usually situated on the left side.* The tumour is somewhat pyriform, the larger extremity resting on the testicle, and by its peculiar appearance and feel its structure is at once apparent; the veins are seen through the integument. Pressure from below upwards, during the recum-

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well as for some time subsequently, the recumbent posture should be enjoined, along with suspension of the scrotum, and the usual antiphlogistic means. When the inflammation, tenderness, and swelling have considerably abated, the reduction of the tumour may be promoted by the daily inunction of equal parts of iodine and camphorated mercurial ointment. — Ed.]

* In upwards of one hundred cases examined by Mons. Breschet of Paris, only one occurred on the right side. With this result, the experience of nearly every practitioner must coincide. Cirsocele may take place at any period of life, in the young as well as in the old; but it is most common, by far, within the first ten years after puberty, or during the period of the greatest excitement of the genital system. In twenty-seven cases observed by Mons. Landouzy, in which this subject was particularly noticed, seven occurred between the ages of nine and fifteen; seventeen between fifteen and twenty-five; three between twenty-five and thirty-five.

Cirsocele appears to be occasionally hereditary. Professor Blandin of Paris, in an able article on this disease, in the "*Dict. de Medicine et Chirurgie Pratiques*," refers to three brothers with whom he was personally acquainted, who were all exempted from military duty on account of the existence of this malady: the father was similarly affected. An analogous case is mentioned in an inaugural dissertation published a few years ago at Paris.

The causes of cirsocele are, venereal excesses, masturbation, protracted exercise on foot or horseback, contusions of the scrotum, inflammation of the testicle, and mechanical obstacles to the return of the blood to the spermatic veins, whether produced by the presence of a tumour, fatty accumulations of the omentum or mesentery, or the wearing of tight and ill-constructed trusses. Of these the first two are probably the most frequent and influential. Indeed, I am persuaded, from considerable experience, that this is the case. How these causes act in developing this affection admits of ready explanation. Their tendency is not only to determine an abundant afflux of blood to, and consequent congestion in, the genital organs, but to produce more or less fatigue in the muscles of those parts, especially in the cremaster and dartos, together with a loss of nervous innervation, which diminish their power and contractile energy. The testicle being thus insufficiently sustained sinks down, by its own weight, into the scrotum, which, with the spermatic vessels, is thereby kept in a state of constant relaxation. Heat acts in a similar manner, and produces similar results. Hence cirsocele is more frequent in hot than in temperate climates, and worse in summer than in winter. — Ed.]

bent posture, diminishes the swelling; pressure above augments it, particularly if the patient change his posture, and exert the abdominal muscles. Sometimes a dull pain in the back is complained of, relieved by suspension of the scrotum, and often wasting of the testicle slowly advances. In some cases the swelling attains a large size, elongating the scrotum, and proving a source of very great uneasiness to the patient — so great that some have requested and urged castration.* Commonly it is sufficient to wear a bag truss, and avoid all causes of irritation to the parts; thus increase of swelling is prevented, and the inconvenience rendered trifling. If pain, with redness of the integument, and additional enlargement, should supervene, rest and the recumbent posture must be enjoined for a time, combined perhaps with low diet and local depletion. But in cases of large inconvenient tumour, accompanied with atrophy of the testicle, rather than accede to the wishes of the patient and perform castration, the treatment recommended many centuries ago may be put in practice — the application of a heated wire to the veins. The upper part of the tumour is grasped and made prominent, the veins are separated as much as possible from the other parts composing the chord, and a small-pointed cautery, a glover's needle, for example, is inserted at several points. This is followed by some pain, and increase of swelling. Inflammation and obliteration of the veins is produced at the cauterised points, the swelling gradually diminishes, and ultimately a dense chord is all that remains. The cure is radical, and I have never seen the effects prove too severe. Rest and antiphlogistic regimen are of course necessary for some days after the application; abstraction of blood will seldom be required. Within the last few years I have been in the habit of passing two needles under the veins at an interval of about half an inch from each other, and twisting a thread firmly over them and the superimposed integuments. Of course the other parts of the chord are held aside by the finger and thumb, and the needles are withdrawn within a few days; as soon, in short, as consolidation of the interposed substance has taken place. This operation is preferable to any other.*

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* [Although the symptoms of this affection are usually well marked, yet it is sometimes liable to be confounded with other lesions. The malady for which it is most apt to be mistaken is inguinal hernia, especially that variety of it in which the omentum is concerned. The best way in such cases is to place the patient on his back, and hold up the scrotum until the vessels are entirely emptied of their contents; the finger is then applied against the external ring and the patient requested to rise, when, if the disease be cirsocele, the spermatic veins will immediately refill, while, if it be hernia, the bowel will be unable to descend.

The progress of this disease is usually tardy, years elapsing before it causes much suffering or inconvenience. In some instances, however, it increases with great rapidity, and gives rise to severe local disorder, with more or less constitutional derangement. One of the most serious and unpleasant effects of this disease is atrophy of the testicle and epididymis, produced by the pressure of the enlarged veins; it may exist in various degrees, from the slightest softness and diminution of volume to almost entire wasting of the organ, and occasionally, though rarely, affects both sides simultaneously. A gloomy and melancholy state of mind, sometimes bordering upon alienation, frequently attends this condition of the testicle. — Ed.]

Hæmatocele is an effusion of blood, either into the cellular tissue of the scrotum, or within the tunica vaginalis, or in both. It is generally the consequence of a bruise or wound. From the loose nature of cellular tissue, the effusion into it is apt, if proper attention be not given, to take place to a great, and, to the patient and friends, alarming extent. This I have witnessed after the operation for hernia, and after removal of the testicle — bleeding from some small artery continues, the blood is by the dressings or pressure prevented from escaping externally, it is consequently extravasated into the cellular structure, giving rise to tumour, often of a very dark colour; and in some cases this swelling, occurring after the operation for hernia, has been mistaken for re-descent of the bowel. The blood must either be absorbed or discharged. Absorption is the more safe and desirable, but necessarily tedious, and more or less thickening and enlargement may remain for a long time. Discharge, whether spontaneous or by incision, is usually followed by unhealthy suppuration of the infiltrated and partially broken down cellular tissue, sloughing of it, tardy separation of the dead parts, and tedious, perhaps exhausting, flow of matter.

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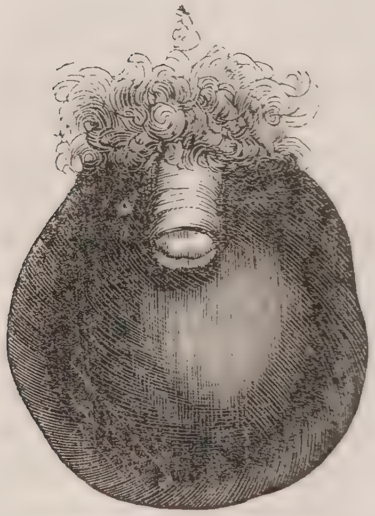
* [The least objectionable operation, in my opinion, is that of tying the affected veins, after having carefully separated them from the spermatic artery, vas deferens, and nerves of the testicle. The vessels may be ligatured at one or more points, according to the extent of the enlargement; and, by carefully excluding the structures just mentioned, there will be no danger of cutting off the nervous and vascular supply, as must necessarily happen, in some degree, in the proceeding recommended by Mr. Liston, and which must therefore lead to further wasting of the testicle; a circumstance which should be most sedulously avoided. The external incision need not exceed an inch and a half in length.

I am induced to subjoin the following account of a novel but harsh operation for the cure of cirsocele, lately devised by Mons. Breschet of Paris, not from any belief or hope that it will be generally adopted, but because it has made some noise in the surgical world. It is founded upon the anatomical arrangement of the part, or the facility with which the varicose vessels can be isolated from the spermatic artery and vas deferens, and afterwards compressed so as to obliterate their calibre. This is effected by means of a forceps with flattened plates, which are worked by a screw. The pressure is applied in a gradual manner, but with sufficient force to destroy the vitality of the scrotum and of the affected vessels. The instrument is usually removed in from six to eight days, during which the patient is left on his back, cold lotions are applied to the scrotum, and the case treated on general principles. When the sloughs are detached, the edges of the sore are approximated by adhesive strips, and the person is permitted to walk about. In this way Mons. Breschet is said to have operated successfully in more than a hundred cases; the average period required for a complete cure being twenty-three days. I have never performed this operation, the severity of which is such as to induce the belief that very few persons in this *republican* country would submit to it. An American surgeon, Dr. F. Hamilton, of New-York, has recently recommended castration for the relief of this affection, and has published several cases in which he performed the operation in illustration of its efficacy. This is certainly a *radical* mode of doing business, but in my opinion a very objectionable one. — Ed.]

Hæmatocele of the vaginal coat may supervene on hydrocele, in consequence of external injury; or bloody effusion may take place from the vessels of the membrane, from sudden abstraction of their customary support, after evacuation of the serous fluid, and whether injection has been resorted to or not; —as happens in careless tapping for ascites. Some of the diagnostic marks of hydrocele are thereby lost; there is no translucency of the swelling, and fluctuation is either indistinct, or altogether imperceptible. The appearance of the contents varies according to the time which has elapsed betwixt their discharge and the occurrence of the extravasation; if short, coagula float in a thin bloody fluid; if considerable, the liquid is thick, dark, and putrid.

Bloody effusion into the scrotal cellular tissue produces a dark appearance of the integuments, and the swelling has a doughy feel. At one or more points, where the cells are broken down and much blood has collected, fluctuation is perceived more or less distinct. The treatment consists of rest, the recumbent posture, support of the swelling on a small cushion, and the employment of fomentation when the parts are painful. The absorption proceeds slowly; and after some time, when all painful feelings have ceased, stimulant embrocation may be used, with the view of expediting it; a solution of the muriate of ammonia, of the sulphate of alumina, or of other astringent stimulating salts, may be employed in strength proportioned to the feelings of the patient and the progress of the case. If the tumour suddenly become painful, and increase in size, indicating putrefaction of the blood, and commixture of it with puriform matter, a free incision is to be made, and poultices applied. When the parts have become quiet, and suppuration has been established, poulticing is to be discontinued, and mild and light dressing employed.



When, on tapping a hydrocele, the fluid is found to be bloody, injection is not to be resorted to, though the other circumstances of the case should appear favourable. Rest is enjoined; and a radical cure is not to be attempted till the fluid has collected a second, or perhaps a third time, and become colourless.

Acute inflammation of the testicle, from sympathy with the urethra, and sudden suppression of discharge from the anterior part of the canal, has been already treated of. The inflammation may also be the result of external violence. When the urethra is diseased, the testicle is irritable, and its circulation easily excited. After subsidence of the inflammatory attack, swelling, particularly of the epididymis, or of the posterior part of the gland, seldom altogether disappears. The new matter is not entirely absorbed; and thickening and induration remain, to an extent depending on the violence of the action and the propriety of the treatment.

Enlargements of the body of the gland are generally attributed to injury. But often they occur without such cause being assignable; and may be the result of chronic excited action, kindled in deposit produced by a previous acute inflammatory attack. Such indolent swellings attain considerable size. The tumour is of an irregular surface, and feels hard and unyielding; there is always more or less effusion of fluid into the cavity of the tunica vaginalis, adding to the bulk of the swelling. Indeed, the size and consistence of the tumour can be correctly ascertained only after evacuation of this fluid.

Many of these tumours, as already observed, are of firm consistence; others are soft and doughy. They occur at the middle period of life, or before it. Some are resolved easily, and by ordinary attention. Others enlarge, notwithstanding the most judicious treatment; they gradually soften, and at length fluctuation becomes apparent. Curdy matter is evacuated by incision, perhaps mixed with a small quantity of thin unhealthy matter; and from the wound projects a pale fungous growth furnishing profuse discharge. The gland has now lost all appearance of its original structure; a section of it presents a homogeneous surface, of a greyish colour, and soft consistence, at some places broken down and mixed with tubercular matter and pus. The fungus is of the same nature as the rest of the tumour, but softer, and often with puriform depôts in its base. In this disease there is nothing malignant; it occurs in people of impaired or originally weak constitution, and is generally known as the *scrofulous testicle.*

In the more simple swellings, the gland at some points retains its original texture, but the greater part has no tubulous appearance, and seems to consist principally of lymphatic deposit, dense, pale, and equable. Such often accompany and are attributable to a diseased state of the urethra, — part of the canal being in an irritable and contracted state; and all efforts to discuss them usually prove fruitless, unless the urethra have been previously restored to a healthy condition. The soundness of this canal is therefore to be inquired into in the first instance, and if stricture, or irritability independent of contraction, be discovered, the practice must be directed towards it. The urethra being sound, counter-irritation is to be applied to the testicle; and the part should be suspended, though not in function altogether; walking exercise, and the friction which it occasions, must be avoided as much as possible. A gum and mercurial plaster protects the part, and induces a moderate irritation of the surface usually sufficient to dissipate the swelling slowly; if ineffectual, either repeated blistering, or the insertion of a seton under the integuments, may be had recourse to — from either or both much benefit is often derived. In obstinate cases the recumbent posture must be enjoined. In general, slight enlargement and induration of the epididymis remains.

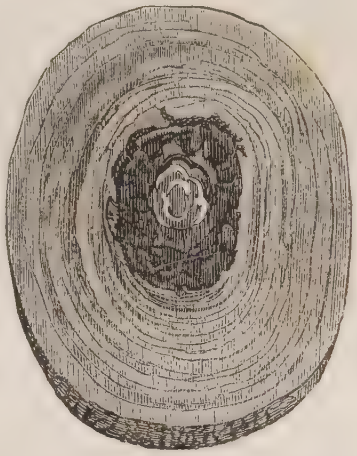
The scrofulous swelling often does not yield to the means for discussion, but advances to suppuration. The abscess is to be opened, and the unhealthy contents discharged; endeavours are then to be made to effect closure by granulation, and after that counter-irritation may dissipate the tumour, or at least diminish its size. If protrusion occur, as generally happens, it may be cut away; and by then keeping the granulations on a level with the integument, either by pressure or escharotics, at the same time attending to improvement of the general health, cicatrisation may be procured, though tedious: or escharotics may be used from the first, instead of the knife. For example, sprinkling the fungous surface occasionally with the acetate of lead, I have found in several instances effectual; repeated sloughing of the protruded matter takes place; it sinks to the level of the integument, and ultimately below it, and then the employment of slightly stimulating dressing induces contraction and closure.

Not unfrequently the testicle is attacked by swellings of a more serious nature — medullary sarcoma is common, as also both fibrous and soft tumours, with cysts; scirrhus is more rare. These morbid alterations may take place at once — that is, the swelling may be from the first malignant — or they may supervene on tumours originally simple and benign. The tumour increases with the usual rapidity; to describe minutely the successive stages, would be but repetition of what has been already stated more than once, in treating of similar diseases in other organs. The medullary tumour often attains a very large size before the integuments give way; it may in some cases be mistaken for hydrocele, unless the history be attended to, and careful manipulation made: elasticity must not be confounded with fluctuation. After ulceration has taken place, the formation of a bleeding fungus is not uncommon: indeed, the testicle is one of the most frequent seats of fungus hæmatodes. The inguinal glands are in general affected early, and swell to a large size, ulcerating extensively, bleeding, and throwing out fungi; not unfrequently the chord feels free and soft, presenting to all appearance a healthy structure between the inguinal and scrotal swellings. In the advanced stages of scirrhous testicle, the chord and its integument are thickened and hard. The progress of this tumour is slower than that of the medullary, but equally certain. The cystic sarcomata, when fibrous, may remain long apparently in an indolent state, and without affection of the lymphatics; but when soft, the cystic contents are often bloody, the medullary matter soon breaks down, and then the integuments yield, and the malignant advance is rapid. It need scarcely be observed, that in such cases nothing but the knife, used at an early period, when the tumour is yet latent and the lymphatics uninvolved, can save the patient. Castration must be performed; and even this is in too many cases insufficient to annul the malignant disposition of which the parts have become the seat. As already stated, it must be had recourse to before hard and knotted swelling in the groin, with thickening and induration of the chord, has commenced, otherwise it can be of no avail.

The patient is placed recumbent. An incision is commenced a little above the inguinal aperture, and carried downwards; on reaching the tumour it is inclined to one side, so that with a similar one on the opposite side an elliptical portion of integument may be included. This is always necessary when the tumour is adherent to its coverings, or when a fungus has been protruded. One straight incision may be sufficient for removal of the tumour; it is sometimes necessary to take away more or less skin, so that a large, loose, and flabby bag may not remain after the extirpation. This preliminary wound penetrates only through the skin and cellular tissue, and should be made rapidly. At its upper part the chord is then to be cut down upon, exposed, and divided; but the division should not be made until the chord has been isolated for some distance, so as to afford a firm hold to an assistant, and not before the assistant has secured it firmly in his fingers, otherwise it may retract within the inguinal canal, rendering the bleeding from the spermatic artery troublesome. The dissection is now to be continued downwards, rapidly, and yet cautiously; the tumour is detached on all sides, and removed along with a sufficient quantity of integument. In dissecting off its posterior surface, care must be taken not to wound the septum of the scrotum. All adherent skin must be taken away, and in the case of fungus, the incision of the integument must be wide of the projecting part. But, at the same time, unnecessarily extensive removal of skin is always to be avoided, otherwise there will sometimes be a difficulty in covering the root of the penis and the remaining testicle. The assistant has, during the extirpation, retained his firm grasp of the chord, so restraining hemorrhage from that quarter; now the branches, generally two, of the spermatic artery are pulled out by the forceps, and a ligature applied to their extremities, inclosure of any of the surrounding parts being studiously avoided. To tie veins, artery, nerves, vas deferens, and cellular tissue, in one mass, would lead to most serious mischief, not to mention the immediate and excruciating pain occasioned. It has been recommended either to pass a temporary ligature round the chord, before its division, to prevent retraction, or to tie the artery before it is cut across. I have never found either practice necessary; the latter retards the operation; the fingers of an assistant are generally as effectual as a ligature, and inflict less injury to the parts, and less pain to the patient. Should the chord slip, there can be but little difficulty in pulling it down again by means of a hook; at the worst, slight extension of the incision upwards may be necessary. The scrotum is to be sponged clean of coagula, and its bleeding vessels secured : they are often numerous. The incision is brought together by several points of suture, and cold cloths applied. In no operation is secondary bleeding more frequent, occurring within an hour or two after reaction has been established, and the patient begun to get warm in bed. The flow is always from the scrotal vessels in the lower part of the wound, and often profuse. The dressing must be partially undone, so as to expose the vessels, and permit of the application of ligature. On this account, it is well not to approximate the lower part of the wound in the first instance, but to fill the cavity with charpie or dry lint, retaining this until risk of hemorrhage has passed over, or better still to have the wound quite open for five or six hours, and then to bring the edges together. The upper part of the incision often heals by the first intention, but this is seldom effected in the lower ; suppuration takes place, and the cavity fills up slowly by granulation. Indeed, attempts to procure primary union of the scrotal wound are scarcely to be recommended ; they are very seldom effectual ; and should bleeding take place, the patient is either put to much pain, by removal of the stitches, and separation of the edges, or the blood is confined, accumulates in the cavity, and is infiltrated into the cellular tissue, producing much tumour, which terminates in extensive and unhealthy suppuration. Such retardation of the cure is avoided by open dressing of the lower part of the wound from the first.

Not unfrequently infiltration of the cellular tissue over the chord takes place within a few days after the operation, extending upwards under the superficial fascia of the abdomen, with discoloration of the integument, diffused doughy swelling, and much irritation of the system. Matter soon collects at one or more points. Early incision will check the advancement of this affection, followed by fomentation, and poultice, and attention to the constitution. Collection of the matter should never be waited for ; and when depôts have formed, a free and dependent opening should be made early. Sometimes the patient may perish, exhausted by the profuse discharge and the disturbance of the system, in cases that have been neglected, or in which infiltration is rapid and extensive and the powers of life weak.

Calculus Vesicæ. Morbid action of the kidneys, producing altered secretion of the urine and deposition from it, takes place in consequence of derangement of the digestive organs — often occasioned by the free use of acids, or of acescent diet, such as fruit tarts, or drink containing a great quantity of saccharine matter. Many causes, which have not as yet been well ascertained or understood, seem to influence and predispose to calculous disorders. The prevalence of these affections in particular districts has been attributed to the quality of the water, or to the use of peculiar food or beverages ; but such opinions, in all probability, have been adopted neither on very good grounds, nor after due inquiry and consideration. The county of Norfolk, and the eastern part of Scotland from the Frith of Forth northwards, are districts very similarly situated, exposed to cold and piercing winds, and appear to furnish a greater number of cases of stone than the rest of Great Britain, with Ireland to boot. The reason of this, as already stated, has not been satisfactorily explained. But this disorder, like gout, seems also to adhere to families, to be transmitted from one generation to another. Some children seems almost to come into the world labouring under calculus.* The symptoms are noticed very soon after birth, and often patients labouring under stone are presented to the surgeon at the tender age of twelve or eighteen months.



The depositions from the urine are various. The deposit chiefly affecting children is of a dark colour, dense, hard, and crystallised; but one lighter coloured, and more friable, sometimes precedes the formation of this dark concretion. As seen here, the nucleus is surrounded by an oxalate of lime calculus, and then follows layer after layer of urate of ammonia. The dark sand or stone is occasionally, though much more rarely, met with in older individuals;

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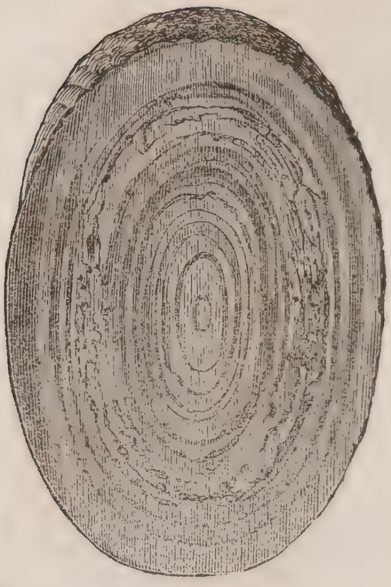
* [Of 5376 calculous cases mentioned by Civiale,[a] 2416 were children, 2167 adults, and 793 old persons. Of these 1946 occurred before the age of ten, 943 from ten to twenty, 460 from twenty to thirty, 330 from thirty to forty, 391 from forty to fifty, 513 from fifty to sixty, 577 from sixty to seventy, 199 from seventy to eighty, and 17 after eighty.

Children are more subject to this affection in certain districts than in others; and the same is true in regard to adults. The greater proportion of calculous cases in Wirtemberg, in the mountains of Switzerland, the Neapolitan States, and some of the provinces of England, occur in young persons, from causes which have not hitherto been explained. In the United States a larger number of children are afflicted with this disorder in Kentucky, Tennessee, and Alabama, than perhaps in any other sections. In very warm or cold latitudes, on the contrary, adults, and, above all, old people appear to be most liable to it.

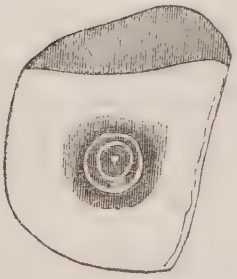
Whether this affection is actually hereditary or not is not yet fully decided. Facts certainly warrant the inference that it is. Thus, Civiale relates the case of a man on whom he practised lithotrity, whose mother had had the stone, and one of whose children died of it. He also performed the operation on two brothers, whose grandfather and two uncles had laboured under the disorder. Prout speaks of a family of which the grandfather and father were affected with uric acid calculi, and who had a son, aged thirteen years, that was very much predisposed to the same disease. — Ed.]

[a] Treatise on Calculous Affections: MS. translation by Dr. Colescott.



but in them the red, dark brown, yellow, and white deposits are more common. And in them, too, the diathesis or disposition to the formation of one or other variety evidently alternates, as is well demonstrated by section of urinary concretions. An alternating calculus is here represented.

The red deposit, by much the most common, at least in adults, consists principally of uric acid, soluble by solutions of the alkalies. The brown and yellowish are also composed of uric acid, often in combination with a base, and are likewise soluble in alkaline solutions, or in alkaline carbonates. The white is most commonly the ammoniaco-magnesian phosphate, soluble in acids; rarely, it consists of phosphate of lime, not so white or friable as the preceding, but likewise soluble in acids; or it may be a compound of phosphate of magnesia, ammonia, and phosphate of lime, very white and soft, and imparting a stain to the finger, soluble in acids, but principally characterised by its fusible property. Specimens are here given of the phosphate of lime, and of the triple phosphate formed as is usual on a nucleus of uric acid, with some base, or upon the mulberry concretion. The dark, hard deposit, chiefly occurring in children, consists of the oxalate of lime, either pure, or in combination with one or other of the preceding, very dense and soluble in acids. When these, by accumulation within the bladder, are formed into concretions, they are always mixed with more or less of a peculiar animal matter deposited from the urine. Passed by the urethra, and settling at the bottom of the vessel as the urine cools, they are termed either morphous, or amorphous, according as they are crystallised or not.



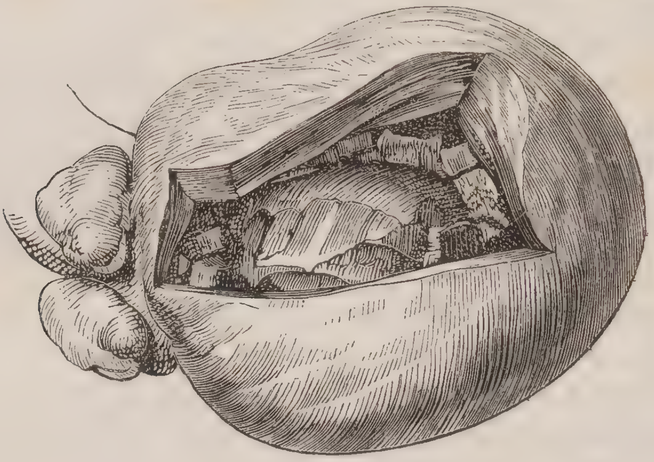
To correct the calculous diathesis is an object of much importance; solution of the concretion in the bladder is now allowed to be impracticable. The principal attention is to be directed to the digestive organs and skin; these must be brought into a sound state by attention to diet, and the exhibition of laxatives, tonics, antacids, &c., as the individual case may require, by exercise and baths. And much benefit is also derived from the use of either alkalies or acids in solution, according to the nature of the deposit. The uric acid diathesis is the most frequent; in that, alkalies, as the carbonates of soda or potash, are to be employed; the potash is preferable. Diuretics and diluents are useful in carrying off the sand, and relieving the painful symptoms; Venice turpentine with squill is on this principle often a valuable remedy, and in some cases colchicum proves of benefit.

The symptoms attendant on the collection and passing of sand, or gravel, as it is commonly termed, are, — pain in the loins; heat in making water; heat in the urethra occurring afterwards, continuing for some time, and usually at the orifice; frequent desire to empty the bladder; and an occasional mixture of blood with the urine. When aggregations of the deposit, forming concretions of some size, pass along the ureters, violent pain is felt in the course of these tubes. Often the patient complains of colicky pains all over the abdomen, and of sickness without vomiting. There is pain in the thighs and testicles, with retraction of the testicle on the affected side.

The calculous deposit may, instead of passing off along with the urine, be accumulated in the body, forming concretions. It is produced by the kidneys, and in them the concretions may be formed and lodged; or it may not accumulate until it has reached the bladder. Usually the stones are produced in the former situation, and after having attained some size descend by the ureters, causing much pain. It is not often that they remain in the pelvis or infundibula till they have become too large to descend; in such cases they increase in their original situation, producing, in general, much more uneasiness and greater danger than if they had reached the bladder. Or they may enter the ureters, and lodge in these canals, distending and obstructing them.

The concretions may be caused by the lodgement of extraneous substances in the urinary passages. Foreign bodies introduced, even in the most healthy persons, are soon incrusted by calculous matter; and the rapidity of the incrustation is in proportion to the tendency to the calculous diathesis. At first the deposit is generally of a brownish colour. Catheters retained in the bladder are soon blocked up by it. Needles, bodkins, leaden bullets, seeds of vegetables, kernels of fruit, bits of catheters or bougies, have been found forming nuclei to urinary calculi — more frequently in females than in males, for obvious reasons.

Some concretions are formed on the nucleus of condensed vitiated secretion from the mucous coat of the bladder, and partly consist of this deposit from the membrane. Such are generally of a dirty white colour, soft, friable, small, and numerous; it is seldom that they are collected into masses of any considerable size. They are usually adherent to the mucous membrane, sometimes forming a broad and thin sheet covering it extensively; other stones, though composed of calculous deposit from the urine, are equally friable as the preceding, and also both numerous and small. So brittle is their structure that they frequently break up by rubbing upon one another, or by being compressed one against the other by the action of the muscular coat of the bladder. Their laminæ in fragments, and the nuclei entire, are, in consequence, often evacuated along with the urine in considerable numbers. Even large and apparently very solid concretions break up most unaccountably in the bladder. This may be, perhaps, so far understood when more than one stone is present. A sketch from a specimen in my collection is here introduced. It was obtained from the body of a medical man. He had, it seems, laboured under symptoms of stone for a long period, and ten years previously to the attack which terminated fatally, had himself ascertained by sounding the existence of calculus in his bladder. One Sunday morning I met this gentleman in consultation about a case of injury of the hip-joint. In three days afterwards I was called to visit himself, nearly moribund, from inflammation of the urinary apparatus, his urethra being blocked up by large fragments of stone.

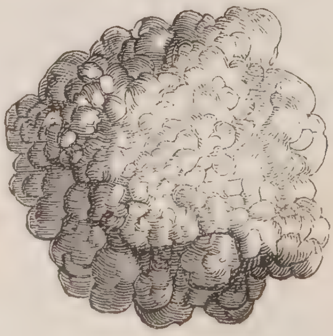


It appeared that on parting with me he had been suddenly summoned to an urgent case of midwifery. He ran quickly down a steep street, and at the bottom of it was seized with an urgent desire to make water, which he did in small quantity, mixed with much blood. He passed some pieces of stone with very sharp angles. He went on from bad to worse; he had retention, and the urethra was found much obstructed; suppression followed, and death terminated his sufferings in a very few days. Many portions of the calculus were voided; much stone, with the nucleus, occupied the bladder and urinary passage; the kidneys were dark-coloured, and one approached to a gangrenous appearance. The practice in the first instance, and so soon as the nature of the case was fully ascertained, should have been to cut into the bladder and clear it of the nucleus and fragments.

It has been elsewhere noticed, that cysts are apt to form in bladders which have been long subjected to irritation from any cause; it need therefore excite no surprise that such formations should be found in patients afflicted with calculous disorders. In one of these unnatural cavities a stone may lodge, both at first small. The concretion receives gradual increase, fills the cyst completely, and then dilates it in proportion to its own enlargement. So long as it is covered by the cyst, the patient suffers but little from it; but when, from the addition of calculous matter, it projects through the opening of the cyst, coming in contact with the coats of the bladder during contraction of the viscus, the usual symptoms of stone are manifested. Sometimes there are several encysted calculi in the same bladder, but in such cases they are seldom of large size.

The stone in the bladder — whether formed in the kidney, and having descended, or originally concreted in the bladder, either spontaneously or in consequence of the presence of foreign matter — produces very marked and distressing symptoms. There is frequent desire to empty the bladder, and the uneasiness is not relieved by doing so. There is pain during and after the evacuation, referred to the course of the urethra, particularly to the orifice. In children, the patient is induced by the pain to grasp the penis, and pull forwards the prepuce, often so habitually as after a time to cause considerable elongation of the latter part. The flow of urine often stops suddenly, and immediately afterwards the pain is unusually severe; the stream reappears on change of position. The body is usually inclined much forwards during the attempts to make water; sometimes the patient rests on his knees and elbows, or on the top of his head, having found that he obtains most ease in these postures. The urine is mixed with ropy mucus, and in long-continued cases with a puriform fluid. After exercise, or unusual exertion, the urine is bloody, A bearing down pain is complained of during the making of water, and often there is simultaneous and involuntary evacuation of the contents of the rectum; the close sympathy between the bowel and the bladder has been already adverted to. In young persons afflicted with stone, prolapsus of the rectum is common, and sometimes it occurs also in adults. Occasionally there is pain in the testicle, or in the back of the thighs, and very frequently a burning heat in the hollow of one or both feet; sometimes there is a fixed pain in the last situation.

Some of the symptoms are more prominent than others, nor is the severity of these uniform. At times the patient is tolerably free from uneasiness; but then a fit of increased suffering supervenes, often attributable to intemperance, or to over-exertion. The intensity of the symptoms also depends on the nature and size of the concretion, and on the idiosyncratic irritability of the patient; in some people the bladder is naturally so acutely irritable as to be thrown into the utmost disorder by the most trifling cause, whilst in others sources of greater irritation produce but very little uneasiness. The mulberry or oxalate of lime calculus, a specimen of which is here sketched, is of very rough surface, and gives rise to the most violent symptoms. But the projecting portions of this, or of other rugged concretions, may become covered by additional and smoother deposit — or the surface may become smooth, polished, and water-worn, receiving no addition for a long time — and in such circumstances the sufferings are mitigated. However, in consequence of fresh incrustation, they may soon become again much aggravated, and almost intolerable.



The increase of the stone is in some cases exceedingly slow; after many years, the size may not exceed that of half a walnut. In others, large dimensions are attained within a short period. The mulberry is always of gradual formation; and the rapidly increasing are generally of the alkaline and earthy or alternating character.

The symptoms above detailed — many, and sometimes all of them — may be produced by other causes than stone in the bladder. Irritation of the bowels, more particularly of the lower, by worms, foreign bodies, or feculent matter of a bad kind — irritation of the kidney — alteration of structure of this viscus, and the lodgement of concretions in its pelvis — are all attended by many of the symptoms of vesical calculus. Irritability of the bladder, the nature of which has been elsewhere detailed, also possesses somewhat similar indications; but the pain is usually referred to the hypogastric region and the perineum, as well as to the point of the penis, perhaps more frequently, and is generally relieved after evacuation of the urine: such is not the case in calculus.

The symptoms and sizes of stone, when severe, will lead the patient to take such means as are necessary to ascertain the cause of them — to ascertain whether or not stone exists in the bladder. The term *sounding* is applied to such examination. In this proceeding the bladder should contain some urine, so that the object may be effected more readily, and with less pain to the patient; he should be desired to retain his urine for one, two, or three hours, as he may be able; or from four to six ounces of tepid water may be injected. In the contracted state of the viscus, the stone may escape detection, if of no great size, from being embraced by the bladder, and concealed in its folds; or, on the contrary, it may be discovered either after or during evacuation of the urine, having eluded the surgeon's search during an over-distended state of the viscus. Also, it may be discovered in one position of the patient, whilst it is lost in another. When the symptoms are decided, examination is to be made, both during the recumbent posture, and during the erect, with the body bent forwards, and likewise with the bladder in various states of fulness; and if unsuccessful, the search is to be repeated. But in general no difficulty is experienced in discovering the stone. The instrument used should be pretty large, with a smooth metallic handle, and either with a large curve and long point, or straight till near the farther end, and then having a short curve. The latter form is preferable, as admitting of the curved part being introduced completely within the bladder, and turned in all directions and into every part of the viscus — the urethra being brought into a straight line by the remaining part of the instrument. The posterior fundus, behind the prostate, is the situation most commonly occupied by the stone during the recumbent posture; and there it is in a measure concealed, when small and the gland enlarged. The surgeon, aware of this, examines that part of the organ very carefully, and, as already stated, explores every corner with the utmost gentleness, and at the same time minutely, never employing the slightest force or rudeness of search. Upon bringing the instrument in contact with the foreign body, or moving it quickly upon it by turning the handle, the sharp clear sound of the stroke can be distinctly heard; and this is one reason why the instrument should be throughout metallic. The prudent surgeon is not satisfied of the existence of calculus in the bladder without this sign.

Not a few practitioners have been deceived, and have subjected their patients to incision of the bladder when no stone was there. A false and deceptive grating is sometimes felt during the passage of the instrument through the prostate; or the point may be made to rub against dense and rough fasciculi of the bladder; or a more distinct feeling, as of stone, may be communicated from the instrument being brought in contact with particles of sabulous matter entangled in mucus, and adherent to the inner coat. The last deception is to be expected only in those advanced in life. But the greater number of those cut necessarily have been young persons. In them the symptoms of stone are closely simulated by irritations of the alimentary canal, and the crying of the patient prevents the stroke on the stone from being distinctly heard.

Perhaps the practitioner may be very anxious to discover a stone and have the glory of removing it, and is satisfied with feeling a rubbing or grating of the instrument; he cuts into the bladder, and to his dismay and discomfiture nothing is found. No foreign body may have existed; or perhaps some small particles of sand which gave rise to the feeling may have escaped detection, being carried off along with the urine and blood. On the contrary, cases have occurred in which a stone actually existed, but was overlooked; and the patient, after recovering from the first incisions, has been relieved by a second and better conducted operation. In diseases of the urinary organs, the surgeon cannot be too cautious and considerate in all his proceedings and interferences. For example: I on one occasion went to see an operation for stone in the bladder, and was asked to feel the stone, but could not. There was merely a sense of grating during the introduction of the instrument; and the operator was dissuaded from his intention. The patient did not live many weeks; a small ulcerated cavity was found in the situation of the verumontanum, but no stone.

By a dexterous use of the sound the size of the foreign body can be tolerably well judged of, as well as the state of its surface, and it may also be known whether there are more stones than one. The bent part of the instrument is passed over and beyond the calculus, and then under it, if possible, so as to ascertain its thickness; and by moving it on each side, the other dimensions are also arrived at. No information can be obtained as to the size of the stone—at least in adults, and when it is not encysted — from any examination by the rectum.

Concretions resembling horse-beans in size, and even larger, can be brought through the adult urethra without incision, by means of properly constructed forceps. The facility with which this is accomplished will depend much on the state of the passage, whether naturally capacious and free from morbid contraction or not, and also upon the condition of the prostate gland. Notwithstanding the greater irritability of the parts in young persons, this operation may be readily performed on them; on several occasions I have removed from children concretions of considerable size through the natural passage. Various contrivances have been used for the purpose. Modifications of what are called Hunter's forceps have been recommended, — two elastic blades shut by being withdrawn into a canula, and made either straight or curved; but they are not so applicable as the forceps of Sir A. Cooper, as modified by Weiss. These are of different curves and sizes, and the handles should be made of metal, smooth on the flat surfaces; for thus the concretion will be more readily felt. The instrument is passed along the urethra, and used in the bladder as a sound; when it has touched the stone the blades are opened, and by raising the handle, pressing the convex part downwards, and then allowing the blades to close slowly, the concretion is embraced. If the stone lie on the forepart of the instrument, on its concavity, it will fall between the blades as soon as they are sufficiently separated. By observing whether or not the wire goes home into the canula, it is ascertained whether or not the foreign body is between the blades; if it is not, the manœuvring must be repeated; if it is, the instrument is to be withdrawn carefully — of course bringing the concretion along with it. Some slight resistance is felt in passing the prostate, as also anterior to the sinus; and on reaching the orifice, some little force is requisite to complete the removal, or the orifice may be dilated by a slight incision so as to facilitate the disentanglement of the forceps with the concretion. By one or more operations of this nature many stones may be removed, and the patient thus freed entirely from the disease. There is no great risk of seizing and pinching the coats of the bladder with this instrument, whilst there is a tolerable certainty of doing so with most of the others.

On one occasion, when practising the operation on the dead body, I found that the instrument had got several stones in its grasp, and was kept so dilated as to be withdrawn with much difficulty — there being no means of disentangling the stones but by farther expansion of the blades, which was impossible. A great many foreign bodies — pieces of pebble — had been introduced; but had the same number of urinary concretions been laid hold of — which is scarcely possible — those farthest from the point and most compressed would have crumbled down, and thus the expansion of the blades would have been diminished. I have not experienced the least difficulty in operating with this instrument, in numerous cases, and at all periods of life. The preferable instrument for the purpose is, however, the small screw scoop. The concretion can by its use be crushed and reduced in volume, so that the urethra does not suffer in the extraction, and the patient is saved much pain. The safety of the proceeding is its greatest recommendation. It is very seldom that any unpleasant symptoms follow; there may, perhaps, be a trifling effusion of blood, and some slight pain in making water may continue for a day or two. Should either irritability of the bladder, or symptoms indicating inflammation of the mucous coat supervene, these must forthwith be combated.

Concretions of such a size as cannot be made to pass through the neck of the bladder, and along the urethra, and yet are not much larger than a filbert, may, if soft and friable, be laid hold of in the bladder by properly contrived instruments, and acted upon so as to be reduced to powder and fragments, which may either pass off along with the urine, or be extracted by means of forceps. This proceeding is not advisable in children, owing to the small size of the parts and their greater irritability, and in consideration also of the concretions in them being in general exceedingly dense; as formerly noticed, they are most frequently composed of the oxalate of lime. In the adult, it cannot be adopted with safety and propriety, when the bladder is irritable and will not bear a certain degree of distention, and when the prostate gland is large. The cases in which the concretion is small, soft, or brittle, and the parts sound and free from irritation, form but a small proportion of those labouring under stone who present themselves to an operating surgeon. However, the bruising, grinding, and rubbing down of stones has been tried in all kinds of cases, but with neither a satisfactory nor an encouraging result; a case will now and then be met with favourable to these proceedings, but they can never become generally applicable, and attempts to make them so will, as experience has shown, be followed by disappointment and disaster.

A stone of a larger size than I have indicated, and of dense structure, may be laid hold of in the bladder, and may by repeated and tedious operations be broken into fragments; but each sitting, as it is called, of the patient, and each attack upon the stone, is attended with more pain, greater risk, and far more exhaustion, than its removal by incision would inflict. The repeated introduction of the instruments, their expansion, and the turning of them about in the bladder, and, if their object is accomplished, the action of the angular and rough surfaces of the fragments on the mucous coat, are certainly followed by an attack of inflammation of the viscus, always tedious and annoying — often excruciating, dangerous, perhaps fatal. Attacks of inflammation of the testicle are also not uncommon, probably from irritation of the prostate, and from the pinching and bruising of the verumontanum, which it is almost impossible to avoid, whatever care and precaution be adopted, when the three-branched instrument is used. In turning to the records of *Lithotrity* — and under this term we shall include all attempts to break down stones within the bladder, whether by drilling, or filing, or hammering — it will be found that many patients have died from the mere exploration; and altogether, nearly a half of those who have fallen into the hands of the experimenters and adventurers have perished in consequence. Every successful case is well advertised; the dead men rest in peace.

But still the operation of breaking up a stone in the bladder is very advisable in certain cases, and may be resorted to with every prospect of a safe, speedy, and successful conclusion. But it can be recommended and employed only within certain limits; the case must be well chosen, and every circumstance must be perfectly favourable as regards the condition of the urinary passage and of the bladder, and the size and nature of the stone. Every operating surgeon should make himself well acquainted with the instruments and their mode of application, so that he may resort to them as occasion requires.

A great deal of ingenuity has been expended of late years in inventing and improving upon the apparatus. Many useless, inapplicable, and highly dangerous machines have been produced, a few efficient and perfectly safe.

The knowledge of the fact that the curvature of the urethra can be effaced, and a perfectly straight instrument, or one with a short curve can be passed into the bladder with equal ease and freedom from uneasiness as a largely curved one, has facilitated very much the application of means for seizing and acting upon a stone in the bladder.

The three-branched instrument, which it is unnecessary to describe, as it can be readily seen and obtained, can be without difficulty brought in contact with the stone, the bladder being partially distended by urine, or filled to the requisite extent by tepid water injected through the outer canula of the apparatus. The branches are then so far expanded, and the drill withdrawn; and by a little cautious management, turning the instrument, altering the degree of expansion, and sounding with the drill, the stone is seized, and then fixed by pulling back the inner canula. By turning the drill with the fingers, and pulling back forcibly the inner canula so as to close the branches, the concretion may at once be pulverised; or it may be again seized, and attacked by the drill on a different side. The operation may, if necessary, be repeated after the lapse of eight or ten days, or sooner, if the irritation caused by the former have subsided. Diluents are to be given so as to facilitate the washing out of the detritus, and strict rest and abstinence from stimuli must be observed for a few days.

Various forms of drill have been contrived for acting on a large surface of the stone; others for scooping it out, the shell to be afterwards broken into fragments and triturated; they are all unsafe and ineffectual. The instrument is also so constructed that a drill-bow may be used, and the apparatus may be fixed by what mechanics call a bench, or it may be attached, by complicated machinery, to the table on which the patient is laid, and be there secured in a proper position. But all this implies an intention of attacking large and dense stones, and a repetition of the attempts. So far as my experience goes — (and besides having seen Civiale and others operate, I have myself employed the instruments in many cases, and very successfully,) — I should dissuade from all endeavours to rid the patient of stone by such means, unless its size and consistence were such that it would yield to one or two attacks.

A plan of crushing the stone, by forcing one part of an apparatus against another by the stroke of a hammer, has been lately promulgated, and by a person who previously maintained that the grinding and rasping was quite perfect, though now regarding them as nought. This percuteur has a short bend at its farther extremity, one-half separates from and slides on the other, and both are provided with teeth. It is very possible to entangle a portion of the bladder betwixt its blades; and, besides, these may bend or break, as they have done in several very bad and abominable cases, in which incisions were required to disengage the instrument from the patient's urethra or bladder. A stone may also be laid hold of by the apparatus, and being so hard as not to yield to the impulse of the hammer, may become fixed in such a way as it cannot be freed from the grasp, there being no provision for pushing it out as in the lithotriteur.

It will be seen from what has been stated, that I am not so sanguine — and I trust I shall be excused of presumption in giving an opinion upon the subject — as to suppose that the breaking up of the stone in the bladder will ever entirely supersede lithotomy. That it would do so was at one time industriously represented, and perhaps believed, by some of the advocates and promoters of lithotrity. If, by some miraculous interposition of Providence, the deposits from the urine should uniformly be pulverisable, and that bladders be made of less irritable stuff than they are, and if, above all, the affected individuals could only be prevailed upon to apply in due time, then might such pleasant anticipations be entertained, and then might we with some reason hope to see them realised; but as matters now are, urinary concretions must, in a great many instances, be cut out of the bladder. Nor is it a circumstance to be very much deplored, since, in good hands, the patient neither endures so much suffering, nor incurs so much risk, as by the proceedings already detailed. The cure, besides, is far less tedious. The stone-grinders, whilst they conceal their own unfortunate results, endeavour to depreciate lithotomy by blazoning abroad the practice of some unlucky surgeon, who, perhaps, loses four in twelve, or six in twelve, of the patients who come under his knife.

It has been said that lithotrity is applicable, when, from the advanced age of the patients and the rigidity of the parts to be cut, lithotomy is not. This statement is incorrect, at least the latter part of it. Old people, from 70 to 80, and even beyond that age, recover, when the operation is conducted quickly, without loss of blood, and so as to guard against infiltration, as certainly and rapidly as young persons. Within the last few years the apparatus for breaking up stones has been very much simplified and improved upon. The screw lithotrite can with great propriety and safety be employed in cases in which the concretion has not attained any very large size, and in which also the urinary apparatus is healthy, and tolerably free from irritability. The cases for this operation must be well chosen, and the proceedings conducted throughout with great caution, gentleness, and judgment. Very full directions are given in the "*Practical Surgery*" for the performance of this operation.

Perhaps no operative procedure has been more canvassed than that of lithotomy. The subject has been discussed, and the operation attempted, by many not very eminently qualified. All sorts of contrivances have been made and promulgated in connexion with this operation; the greater number intended to supply the want either of anatomical knowledge or of operative dexterity. A volume would scarcely contain a catalogue even of the instruments which are in my possession,— crooked staffs, knives, spoons, and forceps. I shall content myself with describing what appears to me the most simple, safe, and certain procedure.

The bladder may be opened, for the removal of stone, in various situations; at its forepart, by incisions above the pubes; in the posterior fundus, by division of the sphincter ani and a portion of the bowel; at its neck, by cutting upon it through the perineum. The first mode is termed the high operation, the second the recto-vesical, the last the lateral. The lateral shall be first considered: it is the safest, the most advisable, and the most frequently resorted to.

Keeping the patient in suspense for days after operation has been agreed on, with the view of preparing him as it is called, is prejudicial. Unless his digestive apparatus be in disorder, or he be labouring under some other affection incompatible with his safety should an operation be performed, the sooner he is cut the better. Delay often inflicts much mental suffering, is apt to induce despondency, and to weaken the defensive and reparative powers of the system. On the night before the operation, a dose of castor-oil, or other mild purgative, is to be administered, so as to obtain an empty state of the lower bowels; should this fail, an enema must be given.

The existence of a stone should be ascertained immediately before proceeding to the operation; it is not enough that the sounding was satisfactory the day before, or at any former period; and the operator will also, for his own sake, satisfy those who are met as his advisers and assistants of the fact that there is a stone in the bladder. All apparatus that may be required should be at hand. A grooved staff, a knife, forceps, a scoop, and an elastic-gum tube, are in general sufficient. A Read's syringe should also be provided, lest the stone should prove brittle, and crumble under the forceps. When the operator has, by previous examination, ascertained that the stone is of an unusually large size, then he must be provided with a narrow, straight, and probe-pointed knife, with forceps of considerable length and grasp, and also with forceps so constructed as to effect crushing of the stone, should this prove necessary.

The staff should be curved, of a size sufficient to fill the urethra, or nearly so, and with the groove placed betwixt the convex surface and the side presented to the left of the patient. This form of instrument will prove the most convenient guide into the bladder. It is introduced fairly into the viscus, and made to touch the stone audibly. Its concave surface is raised towards the arch of the pubes, and retained thus, firmly hooked under the bones — as if with the intent of lifting the patient from the table — perpendicularly straight, without any inclination of the handle, or any bulging of the convexity towards the perineum. After being properly placed, the instrument is intrusted to an experienced assistant, who keeps it exactly in the same position from the beginning to the conclusion of the incisions. He at the same time elevates the scrotum, and standing behind the patient, leaves the surgeon with both his hands at liberty, and with the patient's perineum all clear. The operator is thus enabled to guide the knife by the left hand; whereas, if he use a straight staff, his left hand must be solely devoted to the management of this instrument during the most delicate part of the incisions.

The staff is introduced either before or after the patient has been secured. The fixing of the patient is in this operation very necessary and important; on the proper management of that depends much the facility of completing the operation quickly and satisfactorily. Children are easily and conveniently held on the lap of an assistant, who, grasping the knees, places and secures the limbs so as to expose the perineum. In adults ligatures are indispensable; the hands and ankles are to be fixed together by means of strong and broad worsted tapes; and, in addition, the pelvis requires to be secured, and the limbs must be retained well separated, by two steady and powerful assistants, pressing obliquely down towards each other. A band may also with advantage be passed under the hams, and tied round the patient's neck: the proper position is thus still further secured. The patient is placed on a firm table, of a height convenient to the operator, who is seated on a low stool. A table from two feet and a half to three feet in height, with a stool about a foot lower, will be found to suit very well. The instruments likely to be required are disposed in the folds of a towel placed on the floor, on the right side of the operator, and at a convenient distance.

Before proceeding to incise, the finger is introduced into the rectum to ascertain that it is in an empty state, and also to promote its contraction. A knife is used, with blade and handle somewhat longer than those of a common dissecting knife, and without any edge till within an inch and a half from the point, — held lightly in the fingers, the end of the handle resting on the palm. It is introduced close to the raphe, on the left side, and nearly opposite to where the erector penis and accelerator urinæ approach each other. Its point is made to penetrate through the skin, fat, and superficial fascia of the perineum, and is carried downwards with a slight sawing motion, by the side of the anus — about midway betwixt the anus and the point of the tuberosity of the ischium — and is continued till nearly past the lower part of the orifice of the bowel. The forefinger of the left hand is then introduced into the wound, and the resisting fibres of the transverse muscle of the perineum, and of the levator ani, are touched with the edge of the knife directed downwards. Wound of the rectum is avoided by pressing it downwards and to the opposite side by the finger; indeed the finger should be constantly in the wound as a guide to the knife. In this stage of the proceedings, incision upwards would be likely to interfere with the artery of the bulb, whatever its distribution may be, — whether the vessel come from the pudic, or from the posterior iliac. It occupies nearly the same relative situation in either case, and by care can always be avoided during the second incision. Division of it occasions most profuse, alarming, and dangerous hemorrhage. I have seen the patient lose much blood in consequence during the incisions; and after the occurrence of reaction, have seen the blood soaking through the mattrass, dropping from the foot of the bed, and collecting in pools on the floor. The bleeding is difficult to arrest; the application of ligature is very troublesome, if not impracticable, and efficient pressure cannot be made with safety.

In my own practice I have had little or no trouble from hemorrhage — chiefly, I believe, from never cutting upwards after the first incision. One instance of secondary bleeding occurred. The patient was sixty-one years of age, and had laboured under symptoms of stone for eight years. He had been dyspeptic for some weeks before the operation, but otherwise appeared a favourable subject. Very little blood was lost during the operation, but on the fifth day hemorrhage occurred to the extent of seven ounces; on the eighth day, the same amount was lost; on the twelfth, a pound; on the sixteenth, five ounces; on the seventeenth, about a pound. The bleeding was uniformly preceded by a feverish attack; and the blood had a florid, arterial appearance, and flowed rapidly. It proceeded from the interior of the wound, and a suppurating cavity in the neighbourhood of the prostate was felt by the finger. From the prostatic side of this abscess the blood appeared to spring; probably a considerable branch of the pudic ramifying in this situation had been opened by unhealthy ulceration. Pressure proved always effectual at the time, the hemorrhage recurring on the loosening and separation of the lint. After the last bleeding the dressing was retained for some days, and on its removal no recurrence took place. The patient had been much exhausted by this severe loss of blood, but, notwithstanding, made a good, and by no means tedious, recovery. In one case, also, troublesome hemorrhage occurred within twelve hours from the operation on a patient advanced in life. The bleeding was arrested with some difficulty by ligature and pressure. The patient died on the third day. The cause of the bleeding was found to be ossification, as it is called, or earthy degeneration of the coats of the vessels. The bleeding was from the external hemorrhoidals. The artery of the bulb was untouched.

Many patients have perished within the first day or two from bleeding, owing to the using of the knife too freely, and in an improper direction. By very slight application of the edge to the resisting fibres, and by gentle dilatation with the finger, the membranous portion of the urethra is reached. The knife is passed over the back of the forefinger in the wound, and lodged in the groove of the staff; it is then carried forwards through the prostate, with the edge directed downwards and outwards, cutting the gland obliquely. In this incision the knife is raised very little from the groove, the object being to divide the gland to the extent of no more than barely three-quarters of an inch. By so doing, the reflection of the pelvic fascia remains uninjured, and the boundary is left entire betwixt the external cellular tissue, and that loose and very fine texture immediately exterior to the bladder — betwixt it and the fascia lining the pelvis; thus the risk of urinary infiltration is done away with, at least much diminished. There is great danger in dividing the base of the prostate completely, and much more in cutting any part of the coats of the bladder. When the knife enters the groove of the staff, this latter instrument must be held very steady; if it be at all withdrawn, its point may escape through the wound, and mislead the knife.

There is no great risk of wounding the trunk of the pudic artery, unless by using either a broad instrument called the gorget, or a concealed knife. The former is now almost wholly abandoned. Besides endangering the pudic, it is apt to lacerate the neck of the bladder, pushing the prostate before it, and so tearing its cellular connexions. The latter, the lithotome caché, makes the internal wound larger than the external; the coats of the bladder are slit up to an unnecessary extent, being cut much more easily than the prostate, and the instrument not affording sufficient resistance to the gland.

Through the prostatic opening the finger is easily passed into the bladder, and the stone felt. The staff in then withdrawn. Sometimes it is a troublesome matter to reach the bladder with the finger, in consequence of the straining and struggling of the patient, causing the organ to ascend in the pelvis; the difficulty is overcome by patiently waiting till these exertions cease. By steady and gradual movements of the finger in the wound of the prostate, the opening is much dilated, so as to admit of the ready introduction of instruments for laying hold of and removing the stone. Indeed, the neck of the bladder is capable of dilatation without any incision. In a case of perineal abscess containing a portion of exfoliated bone, on account of which incision was made, it was found that the cavity communicated with the urethra; lest other foreign matter should remain, I introduced my finger into this aperture in the membranous portion, and found that by the most gentle movement I could not only easily reach the bladder, but dilate the opening in it to a very considerable extent.

By the finger in the bladder, the size and position of the stone is ascertained; and no extracting instrument should be employed till after the finger is in contact with the stone. When it is of moderate size, and after having been turned, if necessary, into the most favourable position for extraction, the forceps are introduced. This instrument should be tolerably long, so as to afford power in its use; and the extremities of its blades should be covered with course linen, for thus it is not so likely to slip or to chip the stone as those with raised and projecting teeth. For flat stones, the forceps should be flat-mouthed; for round, more open, hollowed, and bent at the points; or for the latter description of stone, forceps with a sliding joint may be used. The object is to lay hold of the concretion by as many points as possible — to bring a large surface in contact with the instrument. Those with the sliding joint are of no service when the stone is flat, as it either cannot be caught by them at all, or merely by their points, or near the joint; they are applicable only to round stones of considerable size, but they are very troublesome to manage. The instrument is introduced shut, along the finger, and on reaching the prostate is gently insinuated, whilst the finger is at the same time withdrawn. It is brought in contact with the stone, and carefully opened, the handles being raised. One blade is passed under the stone, the other remaining above, and then the instrument is closed, firmly but not forcibly. By the finger, again introduced, along the side of the forceps, it is ascertained whether or not the stone is held securely, and in the proper direction; if not all right, it may then be turned by using the point of the finger and slightly relaxing the grasp. Now the handles of the instrument are depressed, so as to avoid resistance from the bones in the front of the pelvis, and the extraction is commenced, in a steady and gradual manner; if difficulty is experienced, dilatation is effected, and the process facilitated, by moving the forceps gently backwards and forwards; no force or violence is required, either in pulling or dilating; all should proceed smoothly and with deliberation.

The forceps must be proportioned in length to the size of the stone;

a large concretion requires long forceps, both that it may be grasped securely, and that sufficient power may be afforded for the extraction.

Some stones are of such a size as will not admit of passage through the section of one side of the gland. By using the blunt-pointed knife, directed by the finger, without any additional external incision, a wound is made on the right side of the prostate, in the same direction and to the same extent as that on the left. Thus a triangular flap is formed, the apex towards the membranous portion of the urethra, and through the opening thereby afforded any stone, which will pass through the bones of the pelvis, can be extracted without much difficulty. But no benefit can result from cutting both sides of the prostate, either by the double lithotome or in the manner just detailed, in all cases. It is time enough to incise the opposite side when, by introduction of the finger through the usual wound, it has been ascertained that the stone is too large to pass through it. Then it is safer to cut the other side, than to enlarge the original opening, either by the knife, or by laceration in cruel attempts to extract the stone through an insufficient opening.

When the stones are small, the scoop is the preferable instrument. By it the bladder may be soon cleared, even when the concretions are numerous. It is introduced along with the finger, is brought in contact with the foreign body, and passed beyond it or beneath it. Then the point of the finger is placed on the lower part of the stone, so as to steady and secure it, and the scoop and finger retaining this relation are gradually withdrawn along with the stone. More than one, perhaps, may be removed at each withdrawal of the instrument. The flat and slightly bent lever, usually forming the handle of the scoop, is useful should the forceps unfortunately slip during extraction, leaving the calculus impacted in the wound; by insinuating this instrument behind the stone, and employing it partly as a lever, partly as an extractor, removal is completed.

If the stone break, which should not often happen if the forceps be used properly, the fragments must be carefully brought away, the larger by the forceps, the others by the scoop. The sand and detritus which may remain are washed away by injecting tepid water into the bladder, afterwards promoting copious secretion of urine by diluents.

After almost every operation for stone, particularly when the concretions are numerous, or when they have broken into fragments, a searcher is useful to ascertain whether or not all have been removed. It is a slightly curved sound, with a bulbous point. Having been introduced by the wound, it is passed into every part of the bladder with great care, with the view of detecting small calculi, or fragments, which may have escaped the search of the finger, forceps, and scoop. Besides this precaution, the extracted fragments should be carefully examined, and the stones built up, that the surgeon may better judge if they be all there. The surface of the stone affords considerable information; if it be uniformly rough, the likelihood is that it is solitary; if one or more points are smooth, it is probable that these have been occasioned by the attrition of other calculi. If suspicion still exist of part remaining, examination may be made through the wound, during the suppurative stage, six or eight days after the operation, before it has closed much.

It has been proposed to break the stone when very large, to facilitate its extraction, and many instruments have been contrived for the purpose. I have had no experience of the proceeding, but consider the following description of instrument as the best adapted for the purpose — strong, massy forceps, of considerable length; the blades proportionally narrower, but much thicker, than those of the extracting forceps, and armed with several strong teeth, thick at their origin, tapering gradually, and terminating in a sharp ridge; the handles also thicker than they are broad, that they may not yield to the compressing force, and approximated by means of a combination of the lever with the screw. The foreign body is secured firmly between the blades closed on it; the handles are then fixed by a screw and nut, and compressing force is exerted by the lever acting both as a lever and a wedge. The screw, turned by the fingers, will suffice to crush many concretions; and none can withstand the full power of the instrument. But it is, perhaps, safer to open the bladder above the pubes, and extract the stone through a wound in that situation, when it is too large to pass betwixt the rami of the ischia.

When the stone or stones have been extracted, and the surgeon has satisfied himself that no more foreign matter remains in the bladder, the next step in the lateral operation is the insertion of a gum-elastic tube, from four to six inches in length, according to the depth of the perineum, in calibre a little larger than a full-sized catheter, provided with a noose attached to each of two rings at its neck, and at its farther extremity open at both point and sides. It is introduced along the forefinger in the wound, and its extremity lodged fairly within the bladder; a double tape is attached to each of the nooses at its orifice; one is passed up in front, and secured to the fore part of a broad band round the loins; the other is brought under the thighs, and fixed behind. The object of its introduction is to facilitate the escape of urine externally, and prevent infiltration of the cellular tissue by this fluid. The wound, when made according to the directions which have been given, is both conical and dependent — the external opening is free, the internal small, the intermediate space gradually contracting as it approaches the bladder, and the inferior part of the wound of the integument is lower than the corresponding portion of the prostatic section; thus the draining away of the urine is favoured, but it conduces very much to the patient's safety to ensure still farther its free escape by the insertion of a tube — part passes through the tube, and drops from its orifice, part flows by its side according to the laws of capillary attraction. For some hours after the operation, it is necessary to clear out the instrument frequently by means of a feather, otherwise its extremity will soon become obstructed by coagula; in short, this must be persevered in till colourless flow from the orifice shows that the internal oozing of blood has ceased, and that nothing is passing but urine. When by salutary effusion from the vessels the surface of the wound becomes consolidated and imperviable to the urine, the tube is to be withdrawn, but not till then; in young persons it may be removed after twenty-four hours, but in those advanced in life and of relaxed habit it must be retained for forty-eight or more.

The tube is also of service should bleeding continue from branches of the superficial pudic, from small arterial twigs in the neighbourhood of the prostate, or from venous ramifications and the plexus which surrounds the neck of the bladder; for it admits of the application of efficient pressure to the bleeding point, without interfering with the escape of urine, and so increasing the danger of infiltration. Slips of lint are pushed along it to a sufficient depth, and are retained, if necessary, by compress and bandage, the orifice of the tube being left clear. But, as already stated, it is indeed very seldom that this proceeding will be required, if the operation have been conducted with proper caution.

After the tube has been secured by its tapes, or during this process, the patient is unbound; he is placed in bed with the thighs separated and bent, and must be kept very quiet. Diluents are administered copiously, to encourage the secretion of urine; he cannot wet too much. His nourishment must be very sparing, consisting chiefly of bland fluids; and all sources of inquietude and irritation must be carefully avoided. Depletion, whether general or local, will very seldom be required; danger is not to be apprehended from inflammation so much as from infiltration of the cellular tissue by urine. In the fatal cases, unconnected with hemorrhage or exhaustion, the peritoneum is not found vascular or coated with lymph, nor is there collection of morbid secretion from this membrane within the abdominal cavity, but the cellular tissue, along the track of the wound, is black, disorganised, easily lacerable, putrid; or, if the infiltration has not been to such an extent or in such a site as to kill speedily as if by poisoning, unhealthy suppurations are found, extensive, uncircumscribed, composed of sanies, urine, and dead cellular tissue, horribly mixed. Should fixed and increasing pain be complained of in the hypogastrium, the part is to be leeched and fomented; this is the only indication of inflammatory action which has occurred in any of my patients, and it has yielded to the simple treatment here mentioned; so far as I recollect, in only three cases out of more than a hundred, was the leeching necessary. Some patients require support very soon, almost from the first; others evince sufficiency of action throughout, and in them it is very necessary to pay strict attention to the state of the stomach and bowels, lest the action should exceed; some proceed favourably for a time, and then become torpid and stationary, their spirits and constitutional power flagging, in consequence of confinement and the discharge and irritation of the wound, — such also require judicious support, and perhaps slight stimulation.

Union of the wound by the first intention is not desirable; attempts to procure it are dangerous, as conducing to infiltration; the presence of the tube effectually prevents both. Discharge and granulation take place, and the cavity contracts gradually and uniformly. By the sixth or eighth day — sooner in young people, and later in those far advanced in life — the urine begins to flow in part by the natural passage, causing considerable pain in consequence of the urethra having been for a time unaccustomed to its stimulus; and as the opening in the prostate contracts, the escape of urine by the wound proportionally diminishes. When the natural course is completely restored, the wound closes more rapidly than before, granulations soon fill it up, and cicatrisation takes place. Sometimes, though very rarely, a small fistulous opening remains for some time, through which a few drops of urine may occasionally distil; should it prove obstinate in not closing, it may be touched with a heated wire. And sometimes also, when the urine is unusually slow of coming by the urethra, this may be expedited by the occasional introduction of a catheter or bougie.

It is not often that the operation of lithotomy requires to be repeated. In some few cases, however, the calculous diathesis continues, a new concretion is formed, and the patient again applies for relief, perhaps several years afterwards. In such circumstances, the incisions are to be made in the right side of the perineum; for the track of the former wound is now consolidated, firm, and hard, and would be cut with difficulty. But when, from neglect or want of dexterity, the first operation has been imperfectly performed, one or more stones being left behind, the wound may not heal, nor even contract to any considerable extent; and then dilatation of the existing opening, with fresh section of the prostate, will probably be sufficient, though at an interval of many months.

It has been proposed to divide the operation into two parts, with an interval of several days between; first to make the incisions, leaving the stone undisturbed, and after suppuration has been fairly established, and the parts become relaxed, then to extract the foreign body, provided it have not in the mean time been discharged spontaneously — in short, to perform the operation *à deux temps*. This method is liable to serious objections. Two operations must in general be more severe than one. The patient is rendered despondent and miserable after the first, by knowing that the object of his suffering has been imperfectly accomplished, or rather not accomplished at all. Much, and often serious irritation is produced by the wounded bladder being contracted on the hard and rough foreign body; patients have sunk under this torture, and the cure is always tedious. From the earliest times it has been quite well understood, that when the stone cannot be got out it must be left in; but the proposal of always leaving it in, on principle and not from necessity, is really absurd. There is room for suspecting that this mode of operation originated as a virtue from necessity; the extraction of the stone is always the most difficult part of lithotomy, requiring much skill and dexterity, and the operator, finding himself baffled in his attempts to effect it, wisely desists from his futile efforts at the time, and waits for another opportunity. This is certainly better practice than the using of much force, or dilating the wound by incision to a dangerous extent, but it is very far from being so good as the immediate removal of the foreign body, smoothly and quickly, skilfully, and without violence; and it has been already observed, that the cases are very few indeed in which the stone cannot be removed through the prostatic opening without the employment of any force, and, without inflicting any injury to the parts through which it passes — without hazard and without delay. The sooner the method *à deux temps* is expunged from the list of surgical operations, the better will it be for suffering humanity and the credit of our art.

In those rare cases in which the stone is so large that it cannot be brought through the outlet of the pelvis, it must either be broken into fragments, or removed entire through incision above the pubes; as already stated, it is probable that the *high operation* is the safer proceeding. It is, however, an operation attended with much danger. The wound is necessarily extensive, and important parts are liable to be interfered with; and, from not being dependent, the escape of the urine by it is almost certain to cause infiltration of the cellular tissue surrounding the bladder — an occurrence almost always proving fatal and that rapidly. The first part of the procedure is to insure distention of the bladder, so that it may rise in the pelvis, and afford sufficient space between its lower part and the anterior reflection of the peritoneum; but this may prove either very difficult or altogether impossible, even with the aid of injection by the urethra, in consequence of the unyielding contracted state of the viscus, and the great thickening of its coats. An incision is made through the integument and fatty matter, from three to four inches in length in the mesial line, and terminating over the symphysis pubis; the recti and pyramidal muscles are then separated, the cellular tissue cautiously divided, and the fore and lower part of the distended bladder exposed. The coats are pierced at the most inferior part, and an opening made sufficient for the introduction of the finger. By the finger the dimensions of the stone are ascertained, and then the wound is enlarged upwards to such an extent as will by dilatation admit of the extraction. Forceps are introduced, of sufficient length and grasp, and the foreign body removed without laceration or bruising of the parts. The patient is then laid on his side, a piece of dressing being interposed between the edges of the wound to favour the discharge of the urine externally. The escape of this fluid may be free and copious, and the wound may close favourably; but the majority of the patients on whom this operation has been performed, have perished either from urinary infiltration, from peritoneal inflammation, or from exhaustion. Fortunately, I have never had occasion to resort to it.

It has been proposed to combine this mode of operation with wound of the posterior part of the urethra from the perineum, in order that a free and depending outlet may be afforded to the urine, and also, that by introducing instruments into the bladder from the lower opening, the organ may be elevated and stretched so that its fore part may afford sufficient space for the high incision without danger to the peritoneum. With this view the perineum is incised, similarly but to a less extent than in the lateral operation, and the membranous part of the urethra opened. Through this aperture the sound with a stilet for elevating the bladder is passed, and intrusted to an assistant; the incision above the pubes is then made, the stone extracted, and a tube is left in the perineal wound for discharge of the urine. The plan, though complicated, appears feasible, and likely to diminish hazard by preventing infiltration.

The *recto-vesical* method should never be resorted to in preference to the lateral; in other words, it is unwarrantable, in my opinion, in those cases to which lateral operation is applicable. It consists in exposing the neck of the bladder by division upwards of the sphincter ani and lower part of the rectum, and then either making a section of the prostate in the usual way, or dividing also the coats of the bladder in the posterior fundus, when the concretion is large. The cure is tedious and harassing: the urine and feces are discharged together, and hardened feculent matter may accumulate within the bladder; the wound is long in contracting, and often cannot be made to close completely without much trouble, and after a long time; often a fistulous opening remains, communicating with the bladder and rectum, and through this the urine continues to be in part discharged. It has been argued, that the recto-vesical method is advisable, with the view of obtaining more room for extraction of the stone; but to me it appears that the divided rectum will occupy just as much space in the outlet as when entire and empty. Circumstances may, however, occur, rendering this operation, or a modification of it, absolutely necessary, as in the following case — the only instance in which I have encountered an encysted stone. The patient, aged 64, of a spare habit of body, was seized with symptoms of stone in the bladder about twenty-four years previously to my seeing him; at that time he was sounded, but no stone could be discovered. The symptoms gradually subsided, and ultimately disappeared, and he remained for considerably more than twelve years totally free from any affection of the urinary organs. But, about three years previous to the operation, the symptoms returned, and again attentive examination of the bladder was made, without detecting any stone; on introducing the finger into the rectum, however, as high as possible, a firm substance was felt, globular, of considerable size, and very slightly moveable. From this time the symptoms gradually increased in severity, ultimately becoming almost intolerable. At length the presence of a stone was distinctly ascertained by sounding, and the instrument was passed beneath as well as over the calculus; from simultaneous examination by the rectum, it was evident that the hard bulging body was connected with the foreign matter struck by the sound. The lateral operation was performed, and, expecting to meet with a large stone, both sides of the prostate were divided. The forceps were introduced, but the stone, though easily laid hold of, could not be moved. Attempts with the instrument were accordingly abandoned, and further examination made by the finger, when it was found that the stone lay fixed in the lower and anterior part of the viscus, that it was firmly enveloped by a cyst situated between the rectum and posterior part of the prostate, and that only a part, small in proportion to its body, projected into the cavity of the bladder. Of this unusual and untoward circumstance, the medical gentlemen present were also satisfied by manual examination. It was quite apparent that it would be impossible to divide the cyst sufficiently without wounding the rectum, and I therefore determined to lay the bowel, the cyst, and the track of the wound into one cavity. This was effected by cutting the upper and anterior part of the cyst, passing a blunt-pointed and curved bistoury behind the remainder of the cyst, insinuating it through the coats of the gut at that part, meeting the point with the forefinger of the left hand passed per anum, and then carrying the instrument forwards to the surface. A strong scoop, much curved, was passed behind the stone, and without much difficulty extraction was thereby completed. Not above a few tablespoonfuls of blood were lost during the operation, in which not much time was occupied, and no bleeding took place after reaction was established. The cure proceeded favourably, though necessarily slow and tedious, the more so since the patient had been very much reduced by the previous suffering. Some superficial sloughing took place in the wound, but the sloughs soon separated, and healthy discharge and granulation followed. By keeping the bowels gently open, the annoyance from feculent evacuation by the wound was in some measure diminished. The patient was daily out of bed, and took food in good quantity and with relish. At the end of the fifth week, however, he was seized with a severe bowel attack — vomiting, purging, cold extremities, &c. — and the effects of this were never surmounted. The real Asiatic cholera was at that time prevalent, and the patient was under great apprehension of an attack. The weak state in which it left him continued and increased: he was soon confined entirely to bed, the wound made no progress in closing, sloughing of the back took place, and he sank about the end of the eighth week from the operation.

Calculi sometimes lodge in the urethra, obstructing the flow of urine, becoming firmly impacted, and increasing in size. If in the perineal portion of the canal, they are to be fixed and made prominent by being grasped with the fingers, and then exposed by an incision made in the raphe: they are turned out, either with the finger, or by means of a small scoop. If situated in the part covered by the scrotum, the opening should be made, if possible, behind, not anterior to it, for a wound in the latter site will be closed with difficulty. When in the posterior part of the canal, they are reached by incision on the left side of the perineum and opening of the membranous portion. After such operations, the wound, if not anterior to the scrotum, usually closes in a few days.

Calculus of the female is exceedingly rare. Concretions are not so apt to be retained in the bladder as in males; they are passed by the urethra. The symptoms are similar to those which have been described as indicating stone in the other sex. Sounding is easy; it is performed with an instrument slightly bent at the farther extremity, and considerably shorter than those employed in the male. Even when the calculi are of considerable size, they can be removed, as well as other foreign matter, by dilatation of the urethra, effected gradually. Portions of gentian root, and sponge tents, were formerly used for this purpose; but of late years various dilators have been contrived. Some are really new, others have been published as such, though correctly represented in works some hundred years old. Their blades are made to separate in a parallel direction by peculiar adaption of the screw; and, by gradually and very slowly increasing their separation, uniform dilatation is effected. Very soon the opening is sufficient to admit the finger; then the size of the stone is ascertained, and, if necessary, the dilatation is continued to a sufficient extent. When thus the canal has been widened so as to admit of the passage of the stone, forceps are introduced, and extraction accomplished in a direction downwards, that is, towards the vagina. Incontinence of urine is apt to continue for some time after this operation, if the dilatation have been considerable, as well as after the removal of larger stones by incision.

Incision has been proposed in various directions — into the vagina, or by the side of it, upwards and outwards; and it has also been recommended to cut the bladder, on the fore and lateral part of its neck, without interfering with the urethra.

By the latter method the chance of incontinence remaining is diminished, but there is a risk of urinary infiltration, and this will require to be provided against by the use of a tube, as after the lateral operation in the male. A staff is introduced, and by it the urethra is depressed towards the vagina. An incision is then made by the side of the crus clitoridis, and through this the finger reaches the neck of the bladder, more by dilatation than by additional use of the knife.

In one case I removed a very large stone by incision. By a straight grooved staff the urethra was depressed; a straight blunt-pointed bistoury, being slid along the groove, was carried upwards and outwards, first on the left side, and then on the right — dividing the urethra and parts exterior, so as to form a track of wound, which, after dilatation, would admit of the ready passage of the stone. Extraction was easy. Incontinence continued for many months, but ultimately was in a great measure removed by promoting farther contraction of the opening by the cautery. The preferable plan, and one I have since then followed in a few instances, is dilatation to some extent, and by a proper instrument; then slight incision on each side upwards and outwards; then further dilatation; in a few minutes, without much pain, the finger is admitted, then the forceps. The stone is then extracted quickly, with but little pain, and no bad consequences follow.

Gonorrhœa in females is often confounded with *Leucorrhœa*, which is a very common complaint both in married and unmarried women. Leucorrhœa sometimes occurs at a very early period of life, at the age of ten or sooner; and in such circumstances affections of the glandular and osseous systems often supervene. Frequently it precedes the accession of the coloured menstrual discharge, and in many instances is substituted for it; it is always most profuse after the menstrual period. In leucorrhœa there is generally neither heat nor pain during the passing of urine, and the colour of the discharge differs from that of gonorrhœa, though sometimes very slightly; the stain of gonorrhœal matter is yellow with a black border; leucorrhœal is white or yellowish, but does not possess the latter characteristic. The application of leucorrhœal matter will induce discharge from the urethra or from the external parts of some males, but the affection thus caused is, perhaps, not so violent, nor of so long duration, as that which arises from specific contagion. The effects of leucorrhœa on the system are very troublesome. There is general debility, disorder of the stomach, pains of the back, sides, and limbs, a sallow bloodless complexion, paleness of the lips. It is often a cause, at other times a consequence, of miscarriage. Sometimes it is accompanied with a prolapsus uteri, sometimes with thickening of the os uteri. The discharge which attends ulceration of the parts, from whatever cause, is generally bloody, sometimes it is thick, and of a laudable aspect, sometimes thin and fetid. More or less discharge attends polypus, and is often profuse and coloured.

In gonorrhœa the inflammation is usually limited to the external parts, but sometimes extends along the vagina. In neglected cases great tumefaction of the labia takes place, along with excoriation of the neighbouring parts, patchy ulceration around, and swelling of the absorbents and of the inguinal glands. Heat, pain, and scalding, are experienced in making water, but in comparison with the other sex, females suffer little or nothing from this disease. The parts are much less complicated; and bad effects seldom follow either the affection or the remedies employed, however strong.

The inflammatory stage must be subdued by antiphlogistic measures, proportioned to the intensity of the action and the state of the constitution; they seldom, if ever, require to be at all severe. Turpentines, and other internal remedies, which may prove beneficial in the gonorrhœa of males, are of little use. The external means are to be chiefly trusted to, consisting of astringent and stimulating washes; when the vagina is affected, the solutions must be thrown up by means of a syringe. In leucorrhœa, the same external treatment is required, and the use of a syringe is always necessary. The washes most commonly employed are — solution of the sulphate of zinc, of alum, and of the nitrate of silver, or a decoction of oak bark or galls. In leucorrhœa the internal exhibition of preparations of iron and of tinct. lyttæ in pretty large doses may be considered as almost a specific, stimulating the whole system, and correcting that state of morbid debility, both general and local, on which the vitiated secretion depends; and the injection for the vagina, which is perhaps most efficacious, is the solution of the nitrate of silver. The solid caustic may often be rubbed over the surface of the vagina affected by bad leucorrhœa or gonorrhœa, when exposed and brought into view by the speculum, with the best effects. When the menstruation is irregular, blisters and sinapisms may be applied to the loins, with cold bathing, general and local. In gonorrhœa, when only the external parts are inflamed and furnish discharge, the application of a solution of the sulphate or of the acetate of zinc to the parts, by means of lint, effects a cure in a few days — along with strict attention to cleanliness, the observance of rest, regulation of diet, and occasional doses of gentle physic.

Gonorrhœal Lichen not unfrequently follows suppression of the discharge both in males and females. It is preceded by smart fever, headache, and violent pains in the limbs. Inflammation of the fauces is generally present, with superficial ulceration or excoriation; and sometimes the abraded portions of the mucous lining are covered with a whitish exudation. The symptoms subside on the appearance of the eruption, which is papular. It generally appears first on the breast and arms, and then extends over the whole body, accompanied with slight itching. If the case proceeds favourably, the red papulæ disappear in a few days, leaving blains in their stead. Desquamation of the cuticle generally follows. This affection must not be confounded with a cutaneous eruption which sometimes follows the use of copaiba, and which is a species of urticaria.

When the fever is violent, bleeding must be had recourse to, but not to a great extent, and only when it cannot with safety be avoided. Gentle laxatives are to be given. Diaphoretics are very beneficial, and the patient should not be exposed to cold or wet, but kept rather warm, otherwise the eruption may be repelled, the affection thereby prolonged, and the constitutional disturbance augmented. The fauces soon recover under the use of simple gargles. Mercury is hurtful.

Retention of Urine in females arises from tumours, natural or morbid, of the uterus, or of the vagina and appendages, from displacement of these parts, or from foreign bodies lodged in them. But the consideration of such affections belongs to the accoucheur.

Retention takes place in females from paralysis of the bladder, and the same treatment is necessary as in the case of the male. Hysterical women often take it into their heads that they are unable to empty the bladder, and will not attempt it; and though it may be difficult to convince them of their mistake, yet when they are left to themselves for a little, and begin to feel some of the torments which attend retention, they contrive to get rid of their burden, and that without any very great exertion. Sometimes they omit attempting to empty the bladder when they could, and then they cannot effect it when they would do so. Others are still more whimsical, and will push into the viscus needle-cases, bodkins, portions of tobacco-pipes, and such like. The surgeon should be aware of such whims and fancies.

There is, in general, no difficulty in passing the catheter. A short one is preferable, there being less chance of giving pain; and the operation must, of course, be proceeded in with the utmost regard to delicacy. The forefinger is placed in the upper part of the orifice of the vagina, and the point of the instrument, when placed a little above this mark, readily slips into the urethra. It is recommended to use the clitoris as the guide, placing the finger on this, and moving the point of the instrument thence downwards; but when this method is pursued, the catheter is apt to enter the more patent passage. The instrument is to be carried gently onwards, in a horizontal direction, till the urine flows. In some cases of enlargement and displacement of the neighbouring parts, the urethra is elongated, and its course irregular; in such, a long elastic catheter is required. If objections are made to the use of the catheter, at an early period of retention, nitrous ether may be given internally, fomentations applied to the hypogastrium, and a turpentine enema administered. Puncture of the bladder can seldom, if ever, be necessary in the female; if it should be required, the opening may be made either above the pubes or through the vagina. From the latter method there is a risk of fistula remaining; but this, as will afterwards be noticed, can in some cases be ultimately made to close. The operation above the pubes has, in some instances, been necessary during parturition, when instruments could not be passed by the urethra, nor through the coats of the vagina and bladder.

False communication betwixt the vagina and bladder, termed *Vesico-vaginal fistula,* is usually the result of mismanagement during parturition. The bladder has been allowed to become over-distended, and in this state to be pressed upon and bruised by the child's head; or it may have been compressed and bruised by instruments employed in tedious delivery. The consequence is inflammation, violent, and followed by sloughing. On the separation of the sloughs, the urine escapes, perhaps six or eight days after delivery; or the anterior surface of the vagina, and the coats of the posterior and lower part of the bladder, have been lacerated by the imprudent use of the crotchet, or some such crooked and awkward tool; then the escape of urine is immediate. The unnatural flow continues, diminishing after a time, and if the opening be at first not large, and have gradually contracted, ultimately it may escape in but small quantities, at least during the recumbent posture. Of course, the size and site of the opening are very various. I have been consulted in some dreadful cases, incurable and loathsome — the consequence of most culpable neglect and ignorant rudeness on the part of the accoucheur; — the bladder, without any part of its posterior fundus, has been rent so as to admit the fingers; the rectum also torn extensively — in some, merely a shred of the sphincter remaining; feces and urine constantly mixing in one vast offensive cavity. But in general the opening is in the neck of the bladder immediately behind the commencement of the urethra, and nearly in the mesial line; sometimes it is considerably further back. It can be felt by the finger, and is readily brought into view by means of a proper speculum, a copper spatula being at the same time used to prevent the folds of the vagina from interrupting the view; the speculum opened by handles attached to the blades, and prevented from shutting by a serrated semicircular plate interposed, is the most convenient and suitable.

Attempts have been made to close the aperture, by paring the edges, and then inserting sutures; but this is a proceeding both difficult in execution and not likely to prove successful; the thinness of the parts, the presence of a secreting surface on each side, and the oozing of acrid urine betwixt the edges, all militate strongly against adhesion. No benefit can be expected from any treatment, unless the opening be of no great size, and in such cases the cautery will be found most effectual. The speculum is introduced into the vagina, so as to expose the aperture, and guard the neighbouring parts from the cautery; and should the opening not appear distinct, a flexible wire is passed by the urethra, and insinuated through it. A small heated cautery is then slid cautiously along the speculum, and applied lightly to the margins, with the view of producing a superficial slough; this separates, and during the consequent cicatrisation the opening contracts. When the edges have again become smooth, the cautery is applied as before, and by several repetitions complete closure may ultimately be obtained. The interval between the applications is necessarily considerable; each must be allowed to have its full effect. Once I attempted to combine the cautery with the suture; first applying the heated wire, and after separation of the slough, and when the margins were tumefied, excited, and apparently prone to adhere by the formation of new matter, then approximating them by a species of twisted suture. At first, matters proceeded favourably, but the ultimate result was not very successful — it was such, however, as to render the plan worthy of being again tried; if fortunate it would very much abridge the cure. By the cautery I have succeeded in relieving many, and in curing a few perfectly. I cannot quit the subject without expressing regret at the frequent occurrence of such cases. I have had three or four cases in the hospital at one time, and they are constantly being presented for relief.

Imperfections of the female genital organs are sometimes met with. The external parts may be well formed, while the vagina is short, and the uterus and its appendages are wanting; or these may be perfect, and the vagina closed at its external orifice, either by a thin and dense membrane, or by a thick and fleshy substance. Young children are not unfrequently presented with the latter kind of imperfection, but in them there is no need for interference; the urine is not obstructed, and it is only towards puberty that a necessity arises for removal of the deficiency. At this period, the menstrual discharges are retained, if the vagina continue closed, and accumulate in great quantity, producing much distention of the canal, pain in the hypogastrium, general uneasiness in the parts, and sometimes swelling of them to a great extent. On division of the membrane, there is sometimes an escape of many pounds of dark, thick, putrid fluid, and all the symptoms quickly subside. A cautious incision is made in the mesial line, until the obstruction be completely divided; if an opening be found, a probe, or director, is introduced, and by this the knife is guided. There is seldom any risk of the parts again coalescing; when the obstruction, however, is unusually thick, the insertion of dressing between the edges during granulation may be necessary to prevent contraction.

Unnatural adhesions of the external labia occasionally take place, occurring in early life from the healing of excoriation and ulceration caused by neglect of cleanliness. Perhaps the closure is not to such an extent as to prevent escape of the discharges, but still it is inconvenient and requires attention. The parts must be divided in the proper direction and to the necessary extent, and, by the interposition of dressing, reclosure is prevented.

Contraction of the vagina at a distance from the orifice sometimes occurs. On one occasion I was requested by an accoucheur to examine and divide a very tight, firm stricture, scarcely admitting the finger. Labour had commenced, and the expulsion of the fœtus was prevented by the stricture; it was attributed to injury inflicted in a former delivery. By a probe-pointed bistoury, guided on the finger, it was notched pretty deeply at many points — a proceeding which I have frequently followed with advantage in simple stricture of the rectum. Everything proceeded happily.

Occasionally the contraction of the vagina is to a great extent; the uterine discharges are not permitted to escape at all, and great uneasiness is thereby occasioned. In one case, in which the canal may be said to have been wholly obliterated, from what cause or at what period it did not distinctly appear, I ascertained the position of the uterus by the finger passed into the bowel, pushed a curved trocar on to it through a considerable thickness of parts, and afterwards dilated this artificial passage by bougies gradually increased in size. The vagina was thus reëstablished, and menstruation again occurred, and without interruption. A case, in which the vagina was obliterated to the extent of from two to three inches, occurred some months ago at the North London Hospital. It took place, it appears, after an accouchement, the genital organs being raw and sore, with considerable loss of substance from phagedænic ulceration. A large tumour could be felt betwixt the hand placed on the hypogastric region and the finger in the rectum. The patient was exceedingly urgent in her entreaties to have the canal restored, and the attempt was made. The contiguous viscera being emptied, a trocar, guided by the finger in the bowel, was pushed in the course of the vagina as far as was thought safe; the canula was retained, and, some days after its withdrawal, the part was farther dilated by gentian root. It was intended to have carried the pointed instrument farther, but symptoms of peritoneal inflammation supervened about the tenth day, and in spite of active treatment proved fatal. The uterus, os uteri, and from an inch and a half to two inches of the upper part of the vagina, were enormously distended with dark, putrid, grumous, and bloody fluid, of the consistence of tar; the trocar had reached the parietes of the cavity, and, if pushed forward another line, must have entered the vagina, and allowed the fluid to escape. There was a quantity of putrid and dark-coloured serosity in the cellular tissue of the pelvis and behind the peritoneum. It is to be regretted that I did not feel warranted in the first instance in pushing the instrument forward more boldly. Had the fluid been allowed to drain off, the probability is, that the future infiltration and peritonitis would not have occurred. The intention was, being foiled in the first attempt, to dilate the canal sufficiently to admit the finger, and by the direct guidance of that to carry the perforation farther.

Violent and deep *inflammation* of the external parts of generation is not uncommon, — the result of bruise or wound. It is generally met with in the lower class of prostitutes. The inflammation often attacks the vagina and neighbouring parts, followed by great swelling; and, if not allayed, extensive abscess forms, with much fever and pain; pointing takes place betwixt the external and internal labia. The parts must be copiously leeched, and afterwards fomented; strict rest and antiphlogistic regimen must be observed, and when matter has formed, a free opening should be made early, to prevent deep and extensive mischief. A sinus sometimes, though rarely, results; generally the cavity fills up, and the discharge ceases in a very few days. These parts are much more vascular than the lower part of the bowel, and when in a diseased condition, are not of necessity so frequently put in action; hence extensive incision and division of the sphincter is here very seldom necessary.

Tumours of various kinds are met with about the external female organs; more rarely, internally. Encysted tumours of the labia are not uncommon, and sometimes solid swellings, varying in size and structure, grow from these parts. I had occasion to remove one of the latter description, which weighed many pounds, and had been productive of great and long inconvenience. The general rules for the extirpation of tumours apply to them. Considerable hemorrhage may be expected. The operation must be done so as to deform and impair the functions of the parts as little as possible.

New and unnatural growths, or enlargements of the natural parts, as of the prepuce, of the clitoris, or of the internal labia, sometimes occur, and may require curtailment.

The external parts of elderly females may be the seat of warty excrescences, degenerating into malignant ulcer, and demanding free removal by incision.

Tumours of a medullary nature sometimes proceed from the interior of the pelvis, and displace and interfere with the functions of the vagina, bladder, and the neighbouring parts; such cases are of course hopeless, and the treatment must be merely palliative.

Polypous tumours, of various size, structure, and consistence, sometimes grow from the cavity of the uterus, or from its orifice, or from the parietes of the vagina. They are generally attached by a narrow pedicle, except when of a truly malignant nature — occasioning discharge, mucous and vitiated, sometimes bloody, often profuse. Bearing-down pains are complained of, and the health declines in consequence of the discharge. Most of such tumours are benign, troublesome only from their bulk and situation, and from the irritation which they produce in the surrounding membrane. They very frequently have their origin in the substance of the uterus, and are extruded from it, covered by the mucous lining. Removal by ligature is generally the most advisable method of extirpation. The site and nature of the attachment are ascertained, and a strong wire of fine silver, or a piece of whipcord, is noosed round the base by the finger, and pushed down close to the origin, care being taken not to include the healthy parts beyond the growth. The ligature is tightened by passing it through a canula, or along a strong probe, with a ring at each extremity, to the lower of which it is secured. It is drawn more tightly from time to time, till the tumour drop away. A double canula, the portions of which can be separated, is often used for the purpose. By practice only can dexterity in such manipulation be acquired; the object being understood, it must be attained by perseverance.

Malignant disease of the uterus is common. Various morbid alterations are here met with; soft, or hard, or bloody masses, earthy deposits, &c. The disease generally commences in the neck, with fulness and thickening; in many females it is attributable to faulty menstruation, to leucorrhœa, or to other irritations in the neighbourhood. Ulceration sometimes occurs, not of a malignant nature, from similar causes; but in old females this is either of a bad kind from the first, or degenerates, presenting all the usual characters of malignant sore on a mucous surface. The surrounding induration is usually great, and quickly spreads to the neck and body of the organ, contaminating also the neighbouring tissues and the lymphatics.

Some bloodthirsty accoucheurs and operators have attacked the uterus unrelentingly; more than one appears to have been seized with the monomania of cutting out part or the whole of the organ. Numerous females, at a period of life when malignant diseases rarely show themselves, have been subjected to excision of the os and cervix uteri. Some forty and fifty were operated on within a very few months; in almost all of these cases the proceeding was, without a doubt, cruel, reckless, and unnecessary. Attention to the general health, with local applications, would, in all probability, have restored the parts to a healthy condition in the greater number.

Malignant disease affecting the uterus may be removed, at an early stage, by incision, with propriety and safety, and I have done so successfully. The part is examined by means of a hollow tube of tin, polished inside, gently and cautiously introduced. A dilator as well as a speculum is required in the operative proceedings for removal of the parts; and for this purpose the instrument mentioned, when treating of vesico-vaginal fistula, is to be employed. When this has been introduced, the os uteri is laid hold of by one or more vulsella, and pulled down; the diseased portion is then removed by a blunt-pointed knife, the incisions being carried beyond the hard and altered part. There is not much loss of blood, and it is easily arrested by stuffing the vagina. Afterwards bland fluids are injected, and, after a time, those of a gently stimulating nature, to wash away the superfluous discharge, and promote healing. The state of the sore can be occasionally examined by means of the speculum, and nitrate of silver or other applications employed when necessary.

When the disease is in an advanced stage, the neck of the uterus is involved completely, and there is an uncertainty as to how far the morbid alteration extends. Only palliative treatment can be adopted,—soothing applications, and internal remedies according to the symptoms. The practice of some, however, is more bold and decisive. The uterus has been cut out by incision of the abdominal parietes. It has also been removed through the outlet of the pelvis. As was to be expected, the patients have perished from loss of blood, and the shock of such barbarous proceedings; one or two, perhaps, survived, only to die from extension of the disease to the internal parts, within a very few months. Such doings are not justifiable; and, if repeated, should be punished by the execration of all professional men of sound sense and principle.

The *Common Iliac* artery may require ligature, on account of extensive aneurism, involving the internal iliac, or its branches at their origin, or encroaching on the external iliac to near the bifurcation. It may also be necessary, in consequence of wound of the artery, or in cases of secondary hemorrhage from branches of either the external or the internal iliac.

An incision is made through the abdominal parietes, commenced over the passage of the cord through the transverse fascia, and extending upwards, and a little outwards, for five or six inches; its extent depending on the size of the patient, the thickness of the parts to be divided, and the consequent depth of the vessel. By this first incision, the skin and superficial fascia of the abdomen are divided, and then the muscles are penetrated, the line of the preliminary wound admitting of their being cut in the direction of the fibres. After the external oblique has been passed, the proceedings require to be conducted with great caution. The fibres are cut by the hand unsupported, and then the transverse fascia is scratched through, slightly and with great precaution, cutting upon the finger or a director introduced at the lower angle of the wound. By means of the finger, the opening is dilated, and the fascia separated from the peritoneum. This membrane and the parts within it are then, with the utmost gentleness, pushed inwards and upwards, by the hands of an assistant, so as to expose the bottom of the wound. The course of the vessel is now felt for, and by separating the edges of the wound, either by the fingers, or by broad and thin copper spatulæ, its bifurcation may be seen. About an inch or so above this point, the artery is slightly detached from its connections by the point of the knife, separating it from the vein on its posterior and inner surface, and a blunt-pointed needle, armed with a firm ligature, is pushed beneath, without force, and close to the coats of the vessel. The deligation is made firmly, and both ends of the ligature are brought out at the wound; this is then approximated by a sufficient number of stitches, and a compress and bandage applied.

This operation is not often required. I had recourse to it once in bleeding, after very high amputation of the thigh, occurring some days after the operation. The hemorrhage was effectually arrested, but the patient did not recover from the effects of the previous loss of blood, and continued to sink.

Aneurism of the branches of the *internal iliac*, whether spontaneous or the result of wound, is rare. When it does exist, its signs are sufficiently distinct. The old operation — opening the tumour by direct incision, and tying the vessel close to the cyst — has been performed successfully in one remarkable case on record. But this is attended with much risk, there being no means of commanding the bleeding during the incisions, nor until the ligature is placed and secured. The preferable proceeding is to tie the internal iliac near its origin, as has been put in practice successfully in a few cases. The same incisions are made as for reaching the common iliac, and then the sacro-iliac junction is felt for; with the nail of the forefinger the cellular tissue is cautiously and gently separated, and a needle and ligature placed under the vessel. In a corpulent adult, a needle, with a moveable point, may perhaps be useful, as also the copper spatulæ, to keep the parts aside; and a serrenœud may assist in the securing of the noose. It was the fashion once, and perhaps is so still, for every young and aspiring surgeon, when he was about to attempt lithotomy for the first time, to invent or alter some strange crooked tool, for smoothing, as he thought, his way into the bladder. The rage now, more especially on the other side of the Atlantic, is all for curious aneurism needles and tonsil shavers. It ought never to be forgotten, that the simplicity of any proceeding and of every machine is the measure of their perfection. I have had by me a lot of needles, all very ingenious, at the various operations for aneurism which I have had occasion to perform — many of them of the most difficult nature — and the simple needle has always been found to answer the purpose most perfectly.

Aneurism in the groin is not uncommon, and is very easily recognised. The old operation has been attempted, and unsuccessfully. Ligature has been placed on the distal side of the tumour, with no favourable result. One horrid example of the latter operation is on record, in which the femoral artery had been completely obliterated spontaneously, and nerves, vein, and portions of the muscles, were all included in ligature, by one random thrust of a large sharp needle. The *external iliac* is to be tied — a proceeding now regarded as one of the regular operations of surgery, and likely to insure a favourable result. It was first undertaken in a case of secondary bleeding after ligature of the femoral, and since, has often been performed for the cure of inguinal aneurism, with almost uniform success. It has also been practised successfully, on account of hemorrhage after amputation. I was under the necessity lately of putting a ligature round the external iliac, on account of profuse bleeding from an opening in the groin, made five weeks previously, to secure the common femoral, on account of hemorrhage from a stump of the thigh. This operation should have been had recourse to in the first instance, the deligation of the common femoral being an operation not likely to be followed by permanent closure of the vessel, in consequence of its shortness, and the branches given off from it both above and below. The patient ultimately recovered from these three capital operations. The incisions are made in the same direction as recommended for ligature of the common and internal iliacs, but not nearly so extensive. This is preferable to incision, either in the direction of the vessel, or of a semilunar form with one of the corners pointing upwards; the abdominal muscles are less weakened, less injury being inflicted on them, and no troublesome bloodvessels are encountered. The artery is well circumstanced for the application of ligature, affording a considerable extent without the giving off of any branches. It is easily exposed by cautious separation of the cellular tissue, and the ligature is secured either towards its middle, or at its upper part, according to the size and situation of the aneurism.

Popliteal aneurism is of more frequent occurrence than any of the preceding; and in regard to it, also, the old operation has deservedly fallen into disuse. It seems in most cases to be occasioned by partial laceration of the coats of the vessel; a sudden pain, and a feeling as of the receipt of an injury on the part, are generally felt, during some violent or unusual exertion; the pain continues, and an unwonted beating is soon perceived in the ham, along with inconsiderable swelling; the tumour with pulsation increases, and may ultimately attain a large size, causing pain, general uneasiness in the limb, and lameness, sometimes œdema. In cases of long duration, and when the patient is cachectic, the bones become diseased, absorption being caused by the pressure of the tumour, and deep extensive abscess may form in the soft parts.

The *superficial femoral* is to be tied, and the preferable point is where it is crossed by the sartorius muscle. This is always a better practice than removal of the limb, which has not unfrequently been resorted to in cases of large aneurism; there is great risk in such a proceeding, the anastomosing vessels in the thigh are all much enlarged, profuse hemorrhage takes place during the incisions, not completely arrested by any pressure, and probably twenty arteries or more require ligature, as I have witnessed; after all, the occurrence of secondary bleeding is not unlikely. I have tied the femoral artery, with a favourable result, in some cases of very large aneurismal tumour, and in one instance after the cyst had been imprudently punctured. An incision is made from three to four inches in length, and in an oblique direction in regard to the thigh, tracing the inner border of the sartorius muscle, and so placed that its middle may correspond with that part of the artery on which the ligature is to be put. In order to insure the wound being thus situated, there is no need for measurements; these are but a clumsy substitute for anatomical knowledge. The surgeon, well acquainted with the relative situation of the parts, finds it sufficient to ascertain the exact course of the muscle by manipulation, whilst the thigh is slightly bent, and then guides his knife by the eye, unfettered with mathematical diagrams. The muscle is exposed almost by the first incision; the dissection is then continued through the cellular tissue on its inner border, until the sheath of the bloodvessels is reached, the branches of the crural nerve on the fore part being carefully placed aside uninjured; the sheath is cautiously opened immediately above where the muscle conceals it, and the artery separated from its connections to a very slight extent; the needle is then passed, and the ligature applied. The operation, when thus conducted, is exceedingly simple. But embarrassment and delay have often been experienced from following an opposite method, cutting down on the outside of the sartorius; the muscle must either be dissected from its attachments and turned over, or cut across; or the artery cannot be found, and an additional external wound is necessary.

The artery may require ligature at a higher point, either in consequence of wound, or for the cure of femoral aneurism. This disease, however, is very unfrequent. When it does exist, it is usually so situated as not to admit of the favourable application of a ligature below the origin of the profunda; and it may be considered necessary to tie the *common femoral.* The course of this artery being superficial, is easily ascertained; an incision of convenient extent is made in the same line, penetrating the skin and fatty matter; the cellular tissue is carefully separated, and the sheath exposed; a limited opening is made, with corresponding detachment of the vessel, and the ligature applied, close to the lower edge of the ligament of Poupart. But ligature of the external iliac is in all cases to be preferred, for the reasons already given. This has proved successful in more than one case of double aneurism, one in the groin, the other in the ham.

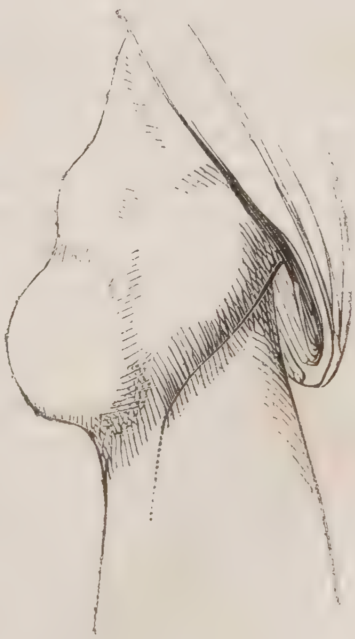
In ligature of the common and of the superficial femoral, the vein is in more danger than the nerve, and the utmost caution is required lest it be punctured. It has been wounded — I witnessed one instance of it; the opening was drawn together and closed by ligature, inflammation of the vein supervened and proved fatal.

When secondary bleeding occurs, on the separation of the ligature, either after this operation or after that for popliteal aneurism, compression is not to be trusted to, nor should the vessel be tied higher in the thigh. From imprudent reliance on the former method I have known patients perish. An incision must be made in the same line as the former, and a ligature placed on the vessel both above and below the bleeding point, as may be necessary.

The arteries of the leg very seldom require ligature, except for wound. In such cases, the source of the bleeding must be the guide to the incisions, and these should be placed so as to interfere with the muscles as little as possible, always in the direction of their fibres. When the bleeding point is arrived at, the vessel is exposed to a short distance, and tied above and below the wound. During the dissection, it will in most cases be necessary to arrest the bleeding by pressure in the ham, either by the fingers of an assistant, or by means of a tourniquet.

The thigh may be the seat of *aneurismal varix,* the result of wound, as in the following case. Fourteen years ago, a young man wounded the lower part of his thigh deeply by the accidental thrust of a narrow chisel. The puncture was in the direction of the femoral artery; violent hemorrhage was the immediate consequence, and after he had fainted the wound was stuffed and compression applied. In eight days the parts had healed, and he returned to work as usual. But about twelve months afterwards, troublesome pulsation was perceived in the part, at the same time the veins of the leg became varicose, and a succession of ulcers formed on the lower and anterior portion of the limb. The affection attracted but little of his notice till about six months since, when he observed a considerable swelling in the site of the wound, beating strongly, and the pulsations accompanied with a peculiar thrilling sound and feel — not confined to the tumour, though strongest there, but extending to the groin along the course of the femoral vein, which was evidently much dilated throughout its whole course. At present the tumour is nearly equal to the fist in size, of regular surface and globular form, pulsating very strongly, and imparting to the hand the peculiar sensation of aneurismal varix, remarkably distinct and powerful. The pulsation and thrilling are continued, in a less degree, to Poupart's ligament, and down to the calf of the leg. On applying the ear close to the tumour, or listening through the stethoscope, the peculiar noise is not only felt, but heard of almost startling intensity — somewhat resembling the noise of complicated and powerful machinery, softened and confused by distance. By making firm pressure on the tumour, the thrill is lost, and the regular pulsation alone perceived; at the same time, the turgescence of the femoral vein disappears, and on compressing the femoral artery in the middle of the thigh, both pulsation and thrilling are arrested, and the swelling much diminished, — but only temporarily, for the collateral circulation is free and complete. He feels little pain, but exercise and exertion of every kind are seriously impeded; constant and firm pressure on the swelling, with uniform compression of the whole limb, has been employed, with the effect of relieving all the symptoms, and rendering the limb much more useful, and by its continuance it is to be hoped that the disease will at least be considerably palliated.

In the lower extremity, as in the upper, the *bursæ* become enlarged, in consequence either of pressure or of external injury. The affection may be acute, following a blow or squeeze, but is most frequently chronic, enlarging gradually and with little or no pain, and caused by habitual pressure on the part. From this, it will at once be understood, why the bursa over the patella should be the one most commonly affected. Its vulgar name, housemaid's-knee, marks its cause — the avocations of such persons requiring them to rest on one or both knees, frequently, and often for a long time. It also occurs in shop-keepers, and other persons accustomed to shut drawers with their knee, or in other ways to make frequent pressure on that part, — in gardeners, and those employed in similar pursuits. In the acute swelling from injury, local depletion, fomentation, and rest are required, and these are generally sufficient to arrest the swelling, and promote its subsidence; but, in some cases, the fluid is deteriorated and the surface inflames, free incision is required, followed by poultice, and afterwards by simple dressing. In the chronic collection of clear fluid, gentle and continued stimulation of the surface, as by the gum and mercurial plaster, causes gradual decrease by absorption; the causes of the affection being at the same time studiously avoided. The tumour sometimes, as here shown, attains a large



size, and from repeated inflammatory attacks becomes consolidated. The cyst is thickened, and lymph is effused into the cavity so as to convert an encysted swelling into one of solid consistence. In such cases as these, the tumour may cause such inconvenience as to make the patient desirous to have it dissected out. This is easily and safely effected; the incisions are made in the direction of the limb, and it is kept at rest in the extended portion for some time, so as to favour the healing of the wound.

Unyielding parts, habituated to pressure, defend themselves by the interposition of a moveable bag containing fluid; betwixt them and the surface the cellular tissue condenses into a cyst, its internal surface assuming a serous appearance, and secreting a fluid resembling the synovial. Such adventitious bursæ are not unfrequent on the ankles and feet, as in tailors, or others usually sitting cross-legged. They may attain a considerable size, and so produce deformity; but they should not be interfered with unless they become inconvenient, as from excited action.

When the extremity of the metatarsal bone of the great toe is large, and consequently the seat of pressure, a bursal formation is produced in the soft parts covering it; this from increase of pressure, or other irritation, may inflame — forming the painful and troublesome disease termed *Bunnion.* Sometimes unhealthy abscess occurs, with thickening, infiltration, and condensation of the surrounding cellular tissue; in such cases, incision and poultice are required, and occasionally it is necessary to destroy the unsound cellular tissue and the degenerated cyst by free application of the caustic potass. The cyst is thus got rid of, healthy granulation takes place, and by afterwards avoiding undue pressure upon the part, a permanent cure is obtained.

It has been elsewhere mentioned, that *cartilaginous bodies* sometimes form within articulating cavities, occasionally attached by a narrow and slender connection with the secreting surface, but generally loose, seldom numerous, and usually of no great size. They are most commonly met with in the knee-joint, producing inconvenience by impeding progression. Sometimes they are neither painful nor annoying, being small, and seldom becoming interposed between the articulating extremities of the bones during motion; such ought not to be interfered with. But when large, they may be so troublesome as to warrant incision and removal. The foreign body is made to project on one side, and, having been made as superficial as possible at a favourable point, is fixed by the fingers of an assistant. The integuments are then drawn to one side, and an incision made over the body, the capsule is cut to as limited an extent as possible, and removal effected by pressure — or it may be laid hold of by a hook, and extracted; if the cartilaginous substance be attached by a pedicle, this must be divided, but with great caution. The integuments are immediately allowed to resume their natural situation, and so to close the wound of the capsule by overlapping it; the skin is then accurately approximated by adhesive plasters. The limb is kept extended, and not the slightest motion of the joint permitted. The patient is confined constantly to the recumbent posture, purged, and kept on low diet; the utmost vigilance is necessary to prevent inflammation of the synovial apparatus. In some patients on whom I have performed this operation, the wound closed by the first intention, and no untoward symptom threatened, motion and the erect position being resumed in a few weeks. But in the last case which came under my care, though the extirpation was performed with the utmost care, most violent inflammation supervened; the wound opened, synovial secretion flowed out in large quantity, profuse escape of unhealthy matter followed, and exhausting discharge continued for many weeks. At one time the constitutional disturbance was so great as to endanger life; the limb was saved with difficulty, the joint anchylosed. From the result of this case, I am disposed to dissuade operative interference, unless the patient strenuously urge it, and be willing to take the responsibility for the consequences on himself.

[The most common distortion to which the human body is liable is *Club-foot;* an affection which has at all times attracted the notice of the profession, but which has received unusual attention within the last ten years on account of the novel operation suggested for its cure by Dr. Stromeyer of Hanover, in Europe. The lesion is, for the most part, congenital. It may, however, be developed after birth, and even at an advanced period of life, from the foot being accidentally placed in a constrained position, and so retained until the soft structures — particularly the muscles and ligaments — are moulded into a new shape, or until they become fixed in their new situation. Various mechanical causes may give rise to this malady, such as splints and bandages, by which the parts to which they are applied are injuriously compressed, or thrown out of their natural relations. Similar results are produced by convulsions, dentition, nervous irritation, contusions, sprains, fractures, partial luxations, and preternatural laxity of the ligaments. In some instances the defect is occasioned by the presence of a corn, an ulcer, or some other disease which induces the person to walk on one side of the foot, the tip, or the heel, to ward off pressure from the tender parts. A vicious habit is thus established, which, if it be kept up, as it often is, for any length of time, leads to irregular action in the muscles, and to distortion of the bones into which they are inserted.

The formation of congenital club-foot has never been satisfactorily explained. By some—as Meckel, St. Hilaire, Serres, and Breschet—it has been ascribed to an arrest of development. This theory, however, for various reasons, is untenable, and has therefore not been generally adopted by surgical men. Mons. Martin, a recent French writer, thinks it is mainly occasioned by the pressure of the parietes of the uterus on the feet of the infant during gestation, owing to a deficiency of the amniotic fluid; an opinion in which he is joined by Professor Cruveilhier. That the disease may proceed from this source in some instances may be readily supposed, but that this is the only cause, is what few will believe. The most plausible hypothesis, in my opinion, is that of Mons. Guerin of Paris. He supposes that the primary mischief is in the nervous system, and that the spasmodic and permanent shortening of the muscles of the affected limb is altogether consecutive. He sums up the results of his numerous observations in the following propositions: — 1. Congenital club-foot is the effect of a convulsive contraction of the muscles of the leg and foot. 2. In the absence of general or direct traces of the convulsive affection we may almost always discover some immediate characters which indicate the nature of the exciting cause. 3. There are three constituent elements in the retraction of the muscles of the part: namely, the immediate shortening of their substance and tendons; a certain degree of paralysis; and, lastly, a consecutive arrest in the development of their substance. 4. There are no other causes of genuine congenital club-foot than convulsive muscular retraction. The pressure of the parietes of the uterus on the fœtus appears, indeed, in some cases, to produce a deformity of the limbs and feet, similar to but not identical with club-foot. The views of Mons. Guerin are confirmed, in some degree, by the history of those cases which occur after birth; but future observation must determine whether they are correct or otherwise.

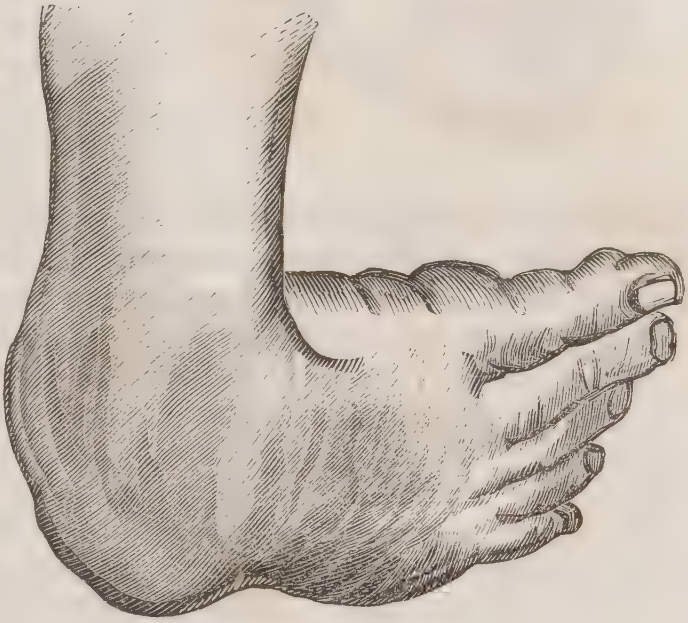
The congenital variety of this distortion often affects both feet simultaneously, though rarely to the same extent. In one hundren and sixty-seven cases reported by Dr. Detmold of New-York, the disease was double in nine-three; in forty-one it occurred in the right foot only, and in thirty-three only in the left. Of eighty cases collected from various sources by Mons. Bouvier of Paris, or observed by himself, two-fifths were double; one-third affected the left limb, and one-fourth the right. Of sixty-one cases furnished by Martin, another French writer, twenty-six were double and thirty-five simple: of the latter, eighteen were of the right and seventeen of the left foot. Mons. Helt has published the results of thirty-one cases, in nineteen of which the disease was double; in two it was more distinctly marked on one leg than on the other; and in one instance the calcaneal form of the lesion was united with the inverted. In twenty-one cases observed by Scoutetten, both feet were deformed in nine; and in the other twelve the right limb was exclusively involved seven times; the left five times.

The disease would appear to be more frequent in males than in females, though the relative proportion has not been ascertained. The following table, embracing three hundred and twenty-nine cases, will throw some light on this subject: —

Authors.	Number.	Males.	Females.
Detmold	167	98	69
Bouvier	80	48	32
Martin	61	45	16
Scoutetten	21	13	8
	329	204	125

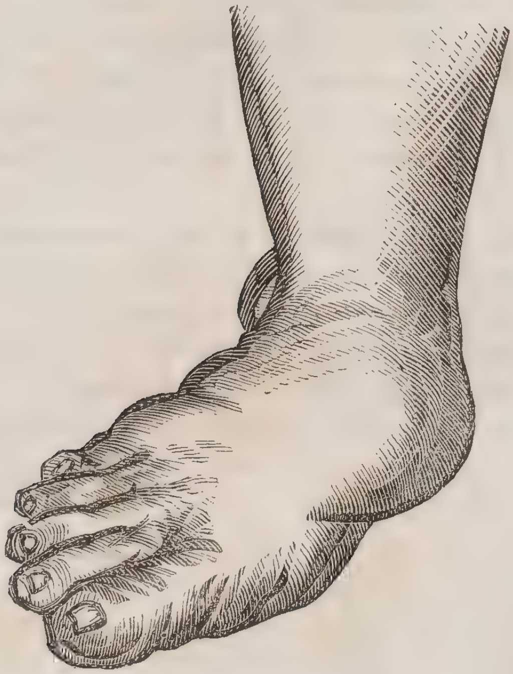
There are certain facts which would seem to show that club-foot is sometimes hereditary; or, at all events, that it may occur in several members of the same family. Thus, Dr. Detmold states that he has been able to trace the hereditary predisposition to this deformity in not less than eighteen cases, and in all, excepting one, to the father's side. Whether this was a mere coincidence, or obtains generally, it is impossible to say. Mons. d'Ivernois relates an instance in which four brothers were all born with the feet twisted inwards; and another writer, Mons. Helt, speaks of a family, which consisted of six children, all of whom were afflicted with congenital club-foot. In the latter case the disease was probably hereditary, as one of the parents was labouring under the same infirmity. It should be observed, however, that club-footed parents do not always produce club-footed children.

Club-foot may be conveniently divided into four varieties — the inverted, everted, phalangeal, and calcaneal — which differ from each other not only in regard to the character of the distortion and the accompanying phenomena, but likewise in relation to the frequency of their occurrence and the nature of their proximate causes. The most common form by far is the *inverted*, usually denominated *varus*, in which the patient walks upon the outer ankle, the great toe being directed inwards and upwards. The muscles of the calf and the adductors of the foot are contracted, and hence there is not only elevation of the heel, but a peculiar inward twist of the foot, analogous to supination of the hand. This alteration occasions the most serious impediment to progression, and when it reaches its highest point imparts a most disagreeable aspect to the affected limb. In the higher grades of the disorder, the sole of the foot is literally scooped out, as it were, as well as deeply furrowed; the instep, on the contrary, is unusually convex and prominent; the small toes generally present in a vertical position, while the big one, separated from the rest, looks upwards and inwards; the outer margin of the foot, which, in conjunction with the corresponding malleolus, chiefly sustains the weight of the body, is almost semi-circular in its shape, rough, and callous; and the tendo-Achillis, forced obliquely towards the inner side of the leg, forms a tense, rigid chord beneath the skin.

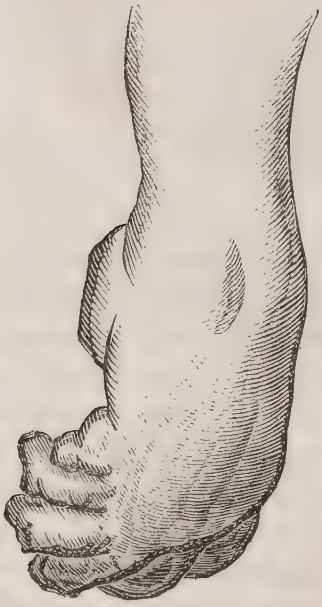


Sometimes both feet are affected with varus, so that their points form an acute angle with the leg; or approach so nearly as to touch, or even overlap one another. In the majority of cases the thigh and leg retain their natural conformation, being merely somewhat atrophied; occasionally, however, one or both knees project slightly inwards or outwards, owing to the contraction of the hamstring muscles.

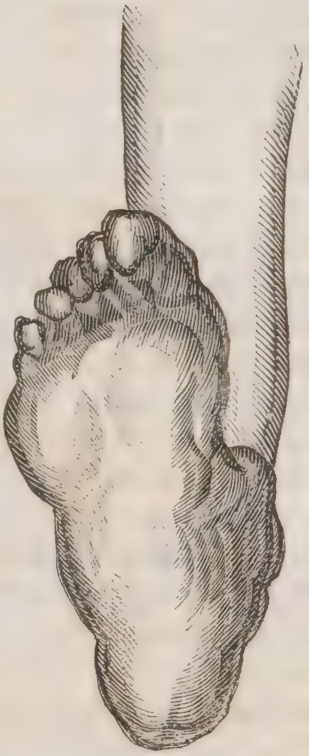
The second variety of this deformity, anciently called *valgus*, may be regarded as the opposite of varus, the patient treading on the internal margin of the foot, while the external is entirely removed from the ground. The sole is directed outwards and slightly backwards, the toes are more or less elevated, and the outer ankle is in a state of semi-flexion. The heel is drawn upwards and somewhat outwards, the internal malleolus is uncommonly prominent, the instep is flatter than natural, and the muscles of the calf, together with the adductors of the foot, are permanently contracted. When the disease has attained its highest point, the patient has an unsteady, vacillating gait, from the difficulty which he experiences in preserving his centre of gravity. Valgus is comparatively rare; and, like the first variety of the distortion, it may affect one or both limbs. It is seldom a congenital affection, but is almost always produced by some local injury — as a sprain or blow.



The phalangeal club-foot — the *pes equinus* of the older writers — is caused by a shortening of the gastrocnemial and soleal muscles, aided, in some cases, by the flexors of the toes. In this species of the deformity the individual walks upon the ball of the foot, the toes, or upon the metatarso-phalangeal articulations, without the heel or any other part of the sole touching the ground. The distance at which the heel is raised varies in different cases, from six lines to four or five inches, according to the extent of the contraction upon which the distortion depends. Considerable diversity is observed in regard to the manner in which the person treads on the ground; most commonly the ball of the little toe bears the brunt of the pressure, but in some instances the weight is thrown upon the great toe, or it is diffused over the whole of the fore part of the plantar surface. In the worst gradations, the heel is so much elevated that the foot forms nearly a straight line with the leg, the toes are much deformed, the instep is unnaturally convex, the plantar aponeurosis is greatly contracted, and the skin above the heel is thrown into dense wrinkles.



In the fourth variety — the calcaneal, recently described by Mons. Scoutetten — the limb rests upon the heel, the toes being drawn upwards, towards the anterior surface of the leg, with which they sometimes form an acute angle. The immediate cause of the deformity seems to be a contraction of the anterior tibial muscle and of the extensor of the great toe, assisted occasionally by that of the common extensor of the foot. The tendons of these muscles form an evident protuberance under the skin, where they present the appearance of tense, rigid chords, which powerfully resist the extension of the limb. The inner margin of the foot, as seen in the cut, is sensibly elevated above the outer, and there is always considerable atrophy of the leg. The distortion, which is almost always congenital, is exceedingly rare. Occasionally the foot inclines slightly outwards, owing to the inordinate contraction of the common extensor muscle.



The changes which the bones, ligaments, and muscles undergo, vary, not only in the different species of club-foot, but in the different stages of the same case. The greatest alteration appears to exist on the part of the tarsal bones, which, although they are rarely completely dislocated, are generally somewhat separated from each other, twisted round their axis, variously distorted, atrophied, or marked by irregular spicula or exostoses. The calcaneum, cuboid, scaphoid, and astragalus, always suffer more than the other bones; which, however, as well as those of the metatarsus and of the toes, usually participate, more or less, in the deformity. The ligaments, in recent cases of club-foot, do not present any material changes, but in those of long standing, or in the higher grades of the affection, they are invariably stretched in the direction of extension, and relaxed in that of flexion. In some instances the original structures are partially replaced by bands of new formation, of a dense fibrous character — the volume and resistance of which vary according to the duration of the disease and the pressure of the parts which they serve to connect together. The muscles also are not much altered in the first instance, except that they deviate from their natural direction, and that, like the ligaments, they are elongated on the one hand and shortened on the other. In ancient cases the whole limb is always considerably wasted, and many of the muscles are remarkably thin and pale, or even transformed into soft, fatty bundles. The cellular substance is condensed and diminished in quantity; the adeps is absorbed; and even the vessels and nerves supplying the affected part are apparently reduced in volume. The skin of the foot, which receives the principal brunt of the pressure in standing and walking, is generally very much thickened and indurated, and large synovial bursæ are often formed beneath it, which are apt to inflame, and thus add to the suffering of the patient. Such is an outline of the more important changes experienced by the different textures in cases of club-foot: to enter more minutely into the subject would be foreign to the design of this article, the object of which is merely to present a general idea of the nature, causes, and treatment of this singular distortion.

The *treatment* of this affection should be delayed as little as possible. The sooner, indeed, it is attended to, the more probable will be the chances of effectually removing it. This is equally true, both of the congenital and of the accidental form of the disease. The bones in early life and in recent malformations are much more easily restored to their normal position than in youth and manhood, or in cases of long standing; and the muscles also regain much sooner, as well as more completely, their original power. In the worst grades of the disease it is often exceedingly difficult, if the treatment be delayed until after the age of puberty, to accomplish a cure without great carving of the tendons, and the constant employment for months of various kinds of apparatus.

It is still a disputed point, whether, in the treatment of this affection, particularly in infants and young subjects, it is necessary, or even justifiable, to divide, as a preliminary step, the tendons of the muscles which are instrumental in keeping up the distortion. Without endeavouring to settle this question, for which the time has not perhaps yet arrived, I must express my conviction that the present rage for tenotomy is calculated to do a vast deal of harm, not only in individual cases, many of which do not require it, but, what is worse and more deeply to be lamented, in bringing discredit upon an operation, which, if judiciously performed, cannot fail to be of the greatest benefit. In most of the cases occurring in children under two or three years of age, division of the tendons is altogether unnecessary; indeed, one of our most distinguished orthopedic surgeons, Dr. Chase of Philadelphia, seems to trust almost entirely to the employment of apparatus, and to resort to tenotomy only in the worst grades of the disease. Whether this practice will ultimately be adopted by the profession generally, or the division of the tendons be restricted to particular cases, it would be premature to predict; but my opinion is, that much more cutting is now done than is necessary, or than would be done if the treatment of the disease were better understood than it appears to be.

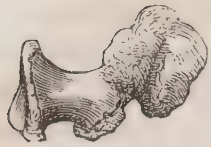
Different kinds of apparatus are in vogue for the cure of this deformity, and it is therefore impossible to determine which is the best, or which should be employed to the exclusion of the others. Every practitioner seems to have his own notions on the subject, and to adopt such measures as whim, fancy, or caprice may dictate. Whatever apparatus be resorted to, the great caution to be observed, on the part of the surgeon, is, that the extension be made in a slow and gradual manner, that the skin be protected from friction and uneven pressure, and that the dressings be steadily retained during the night, as well as during the day, until several weeks after all deformity has disappeared. The object of these directions is self-evident, and too important to be neglected in our curative procedures. The time required for restoring the limb to its normal position must necessarily vary in different cases, and depend upon so many circumstances as to render it impossible to lay down any specific rule. From six weeks to four months, however, may be considered as a fair average, though occasionally a much longer period will elapse. The division of the tendons of the contracted muscles generally expedites the cure by several weeks.

In the operation for dividing the tendo-Achillis the patient may either lie on his abdomen or sit on a chair, and the heel is to be drawn downwards by an assistant with the left hand, the right being placed upon the plantar surface of the toes. The necessary tension being thus given to the part that is to be cut, the surgeon passes a narrow, straight, sharp-pointed bistoury through the skin, from one to two inches above the internal malleolus, flatwise between the tendon and the deep-seated structures. The knife is then pushed on until it reaches the opposite side of the tendon, when its edge is brought in contact with the anterior surface of the chord, which is now completely divided by steady pressure upon the handle of the instrument. The separation of the parts is indicated by an audible snap, and by the immediate cessation of the tense resistance of the tendo-Achillis. Scarcely a drop of blood is lost during the operation, which is almost unattended with pain, and is accomplished in a few seconds. A strip of adhesive plaster is applied over the little puncture, which generally heals by union by the first intention; and the limb, laid in an easy position, should be supported by a pasteboard splint and a common roller. The apparatus for keeping up permanent extension may be advantageously employed in three or four days after the operation.

The interval between the divided extremities of the tendon is filled up with coagulating lymph, which is often poured out in considerable quantities. As in other situations, it becomes gradually organised, and is finally converted into a firm, dense substance, not unlike the original structure.

The tendon of the posterior tibial muscle may be cut most advantageously about two inches above and behind the internal malleolus. The operation is conducted upon the same principles as in the preceeding case, and the only particular caution to be observed is to avoid the posterior tibial artery and nerve, which might be endangered by carrying the knife too deeply. The most favourable situation for dividing the anterior tibial muscle, is where it passes over the ankle-joint: the long flexor of the great toe may be cut in the sole of the foot, where, when it interferes with the rectification of the limb, it forms a tense, prominent chord. — Ed.]

The phalanges of the toes in general resemble those of the fingers in their diseased actions. *Exostosis* of the extremity of the distal phalanx, however, has no analogy in the upper extremity; it is by no means an uncommon affection, and usually occurs in the great toe. The growth is generally globular and rough in its extremity, narrow at its origin, attached on the dorsal aspect, projecting obliquely upwards, and always of similar structure with the phalanx. Sometimes



they are met with of a size nearly equal to that of the bone from which they spring, but the majority are considerably smaller. The only one I have met with springing from a small toe is here sketched. At first the patient complains merely of pain in the part while walking; soon the pain increases so as to impede progression very seriously; then the nail is found to be raised at its margin, and to cover a hard, unyielding, and tender swelling. The elevation of the nail increases, and the tumour becomes more apparent, covered by hardened cuticle, causing great uneasiness, and almost entirely preventing walking exercise.

It has been recommended to expose the tumour by incision, and remove it at its origin. This affords temporary relief, but the disease is generally in no long time reproduced, and the incision must either be repeated, or the phalanx amputated. The preferable practice, according to my experience, is to remove the phalanx at once. It is less tedious and painful than the incision, produces very little, if any, impediment to progression, and of course is quite effectual in eradicating this most annoying though apparently simple disease.

Of Fractures. — Deformity, shortening, loss of power, unnatural motion on extending and moving the part, pain, and grating, mark solution of continuity in bone, or fracture. Swelling, with spasmodic of these symptoms may be wanting; there is little deformity, and no shortening, when one of two or more action of the muscles, soon takes place. One or several parallel bones is fractured. In fracture of the extremities, extrication of air into the cellular tissue, about the ends of the bone, is not unfrequent, though difficult to account for — giving rise to crepitation, superficial, and quite a distinct sensation from that imparted by the broken bone.

Bones become brittle as age increases, and fragility is also induced by certain disordered and debilitated states of the constitution. In some patients, the bones give way on very slight force being applied, after what may have been supposed a rheumatic attack; the thigh is broken by turning in bed, or by walking from the bed to a chair. In one instance, I had put up a fracture of the thigh with a long splint, and in three weeks afterwards the humerus was broken over the end of the splint during an attempt by the patient at change of posture. In many such cases union either does not take place, or is very imperfect.

In children, the bones frequently contain little earthy matter, bend easily, and often break partially on the convexity of the curve. Even at the age of twelve or thirteen, bending of the bones from injury sometimes occur to a great extent, as of the forearm from a fall on the palm of the hand; in adjusting the parts, a slight crackling is heard when they are brought nearly straight. Complete solution of continuity, though more rare, is occasionally met with in very young subjects.

Fractures are generally the result of great force applied directly to the shaft of a bone, or to its extremity; but they are also not unfrequently caused by twisting of the limb whilst the muscles are in a powerful action. Bones are broken transversely; but more frequently there is a degree of obliquity in the fracture, and the fragments are generally detached. A bone may be split longitudinally, as from a musket-ball striking its shaft in the centre; and fissures often extend from a cross break to a considerable extent, sometimes into joints.

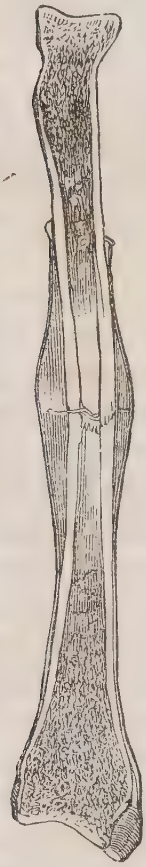
Swelling is often rapid, from extravasation of blood; at other times it is slow, and of a serous character. At first it is soft and yielding, but after a time painful inflammatory tumescence supervenes, the violence and extent of which will depend on the severity of the injury, and very much also on the treatment to which the parts are subjected. If the bones be put as nearly as possible into their original position, and retained so, judiciously — the limb being laid in a comfortable and unconstrained posture, and the bandages, splints, &c., properly adapted — little or no pain or inflammatory swelling will occur; no more action ensues than is required for reparation of the injury. If, on the contrary, the bones are allowed to remain unreduced — perhaps after being well handled — their broken ends, laying among the soft parts, are pulled out by violent spasms, lacerations of the muscles and vessels is increased, effusion, swelling, and violent inflammatory action occur, the pain becomes excruciating, fever and delirium follow; there is an imminent risk of gangrene, and extensive suppuration among the muscles is almost inevitable. If the patient recover, the union is bad, and the limb deformed.

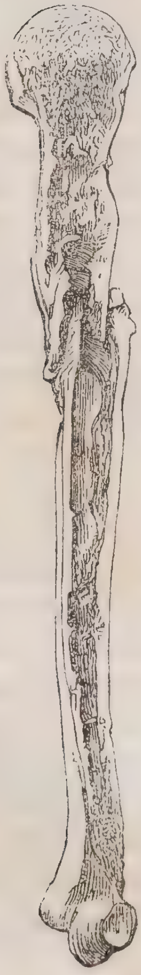
A fracture is said to be *simple*, where there is no wound of the superimposed integuments. The external parts may be bruised, or the deep structure much injured, with laceration of the vessels and rapid and great swelling; or there may be little or no injury of the soft parts. Great danger may exist without division of the integuments; these, yielding under the force, may remain entire, whilst by great and direct violence the bone is comminuted, the muscles broken up, and the vessels and nerves torn, — the limb is infiltrated with blood, and must become gangrenous as soon as reaction takes place. But usually these untoward circumstances do not exist in simple fractures, the soft parts being but slightly injured.

Fracture is *compound* when the integuments are divided by the external force, so as to expose the broken bone. But the wound may not penetrate to the bone; and then the accident is termed fracture with wound, not compound fracture. The soft parts are often divided by the sharp end of the bone; this is frequently the case in oblique fracture, occasioned by a fall from a height, the lower fractured extremity being pushed forcibly upwards. The muscles are usually much injured. The wound is either large or small, lacerated or clean.

Fracture, simple or compound, is *comminuted* when the bone is divided at the broken point into fragments, either small and loose, or large and adherent to the covering of the bone and other soft parts.

Fracture may be *complicated* with wound or displacement of a neighbouring joint, and with laceration of large bloodvessels and nerves.





Union of divided bones, as of soft parts, is preceded by incited circulation in the part, and effusion of organisable matter. The extent of action is regulated by that of the injury, whether inflicted by accident or by operation. If the soft parts have not been much bruised, if the bone and its covering are merely separated and slightly displaced, and then speedily put in contact, the incited action and the effusion are limited to the divided parts. There is no irregularity afterwards at the point of fracture, the new matter that is not required being absorbed soon after deposition; the bone is smooth and even as before. The deposit of new matter under the periosteum and into the medullary canal is here well exhibited. By this means only is the bone kept together for a very considerable period; afterwards the broken ends are united, and the temporary callus absorbed. If, on the contrary, there is much displacement, and if that is not entirely removed, intense action ensues both in the soft and hard parts, there is great effusion of new matter, or callus, soft and yielding at first, but gradually becoming hard and dense — bony particles being deposited from the vessels ramifying in the extremities, or in the attached fragments, of the old bone. When detached portions of callus are found lying in the soft parts, a piece of old bone which retained its vitality has generally formed the matrix of the deposit. When the ends of bones have been badly placed, and meet each other at an angle or curve, occasionally osseous deposit seems to form in the concavity. This increases in size, unites with the portions of the shaft, and forms a sort of bridge uniting them. This by M. Gulliver has been termed accidental callus.

In badly reduced fracture the swelling is great and hard. The callus is exuberant, much being required for the union of the fractured ends that overlap, and are perhaps far from being in contact; the vascular action and accompanying effusion are great, according to the necessity for them. The bone at the united part is enlarged to perhaps double its original thickness, or even to a greater size. After some time, the ends of the old bone, and part of the new deposit, are rounded off by absorption of the protuberances, and the part becomes more shapely. The canal of the bone and the cancellated texture is again restored. The accompanying sketch of a section of the humerus shows a double fracture. The superior one near the neck, where there is still some thickening, had been well adapted, and the canal is quite perfect. In the other and more recent there is considerable overlapping. The portion of outer osseous shell projecting into the medullary canal would in the end have been removed by the absorbents, and the deformity much diminished.

When the ends of the bone are not well placed, or when they are moved occasionally whilst the uniting medium is still soft, there is danger of a false joint being formed — the callus either giving way, or being all along imperfect, and the extremities at the soft part becoming smooth and moveable on each other ; or incited action may run high and terminate in suppuration, with death or ulceration of portions of the bone.

Fragments are sometimes entirely detached at the time of the accident, and perish at once ; or are so slightly connected with the shaft that they lose their vitality on the first accession of inflammation, become surrounded by purulent matter, part from their slight attachments, and come towards the surface. Or the shaft itself may be so bruised by the violence of the injury as to be incapable of resisting incited action, though slight. By malpractice, such untoward consequences as the preceding, and many others beside, are frequently induced.

The uniting medium of separated bones remains soft for some time, as was already observed ; and often, whether from the state of the constitution, or the circumstances connected with the fracture, the parts remain long moveable. Pregnancy is said to prevent union ; but I have often seen fractures in pregnant women unite as speedily and firmly as if the patients had been in that state, and otherwise in robust health ; profuse uterine or vaginal discharges, or determination to particular parts or organs, will certainly retard union.

In ordinary cases, the limb, if not lying altogether straight, can be moulded into a proper form after the lapse of eight or ten days from the time of injury, without the patient suffering any great degree of pain, without the process of union being at all interrupted, or the cure protracted ; even at the late period of five or six weeks, badly united fractures may sometimes be much improved by gradual pressure and change of position. A gentleman fell from his horse, and sustained simple fracture of both bones of the leg, near the middle. It had been laid and retained on its side. I saw him exactly six weeks after the injury ; the leg was much curved forwards, and the foot turned outwards. The limb was placed on the heel, and a long splint, with a foot-piece, applied on the outside ; by attention to its position, and by gradually tightening of the bandages, it soon became quite handsome. Care should be taken not to allow the patient to rest too soon on the fractured limb ; for though quite straight, symmetrical, and of the proper length, when the retentive apparatus is discontinued, it may become short and deformed in a few days from even slight weight being put upon it.

The period at which firm union takes place varies ; the process is more rapid in young people than in those advanced in life, and will depend more on the extent of the injury, and its vicinity to the centre of the circulation than on the size of the broken bone. The requisite length of confinement is regulated by these circumstances, and by the use to which the part is to be afterwards put; the lower limbs require longer time for consolidation than the upper.

In the treatment of fracture, as in solution of continuity in the soft parts, great advantage is gained by placing the disjoined parts as nearly in their original position as possible, retaining them so, and allowing of no motion. These indications ought to be accomplished very soon after the accident; many evils are thus prevented — the further laceration of the soft parts, the inflammatory effusion into all the tissues, and the consequent startings and spasms of the muscles. This cannot be too much insisted on. There is much folly and absurdity in allowing a broken limb to lie unrestrained — leaving the ends of the bones displaced, the one riding over the other — whilst attempts are being made to keep down the inflammation, by applying leeches, cold lotions, or large poultices — all perfectly ineffectual so long as the palpable cause of incited action remains unheeded. The circumstances which kindle and keep up inflammation should always be understood; they are easily discovered in fracture, and when understood should never be lost sight of. If the parts be replaced there will seldom be inflammation; if they remain displaced, the inflammation is so great that it is impossible to subdue it by any means short of removal of the cause. There is also an impossibility, — not to mention the patient's sufferings, — of reducing bones to a good position some weeks after the accident. Such practice has been extensively followed and recommended by some, even modern writers; they set about reducing a fracture at a period after the accident, at which, by proper treatment, union would have been completed, or at least far advanced. The confinement and suffering of the patient are increased threefold, and after all the cure is bad, and there is a risk of false joint.

In all fractures, whether simple or compound, comminuted or complicated, if an attempt is to be made to save the limb, let reduction be immediate; coaptation and retention of the separated parts cannot be made too soon. A neglected case may be met with, in which the intensity of inflammatory action in all the tissues may forbid immediate interference. But even though inflammatory action has taken place to some extent, there are no surer means of arresting it than removal of its cause — the irregular ends of the bones being taken away from among the soft parts — provided it can be done without violence or increase of tension. Reduction is facilitated by proper position of the limb, by relaxation of certain sets of muscles. Extension and counter-extension are made, and but very little force is required; the surgeon extends the limb with one hand, and resists with the other; when the system is excited, and the muscles act spasmodically, an assistant may be required to steady the limb, and to resist the extending power which the surgeon employs. Then the position of the limb and of the patient, when long confinement is required, must be considered, and rendered as easy as possible, though at the same time secure. The apparatus for retaining the bones in the right position must be varied according to circumstances.

In compound fractures, when the wound is so small and clean that adhesion readily takes place, the cure is as rapid as in the simplest form of accident; but when the soft parts are much lacerated, the breach in them must be repaired by granulation; there will be profuse discharge from the wound, with risk of deep suppuration, and union of the bone will be slow. To accomplish reduction, long and sharp pieces of bone may require to be removed by means either of the saw or of the forceps, or else the wound must be dilated; both proceedings may be necessary in some cases. Detached portions of bone, and foreign bodies, if any, must be taken away; and the edge of the wound may be approximated when a reasonable chance of adhesion exists. The limb must then be properly placed and secured. Inflammatory action, should it threaten, must be kept down, but bleeding and purging are to be employed with caution. The action and its consequences are moderated by one or two depletions, but these must not be had recourse to without due consideration of circumstances; strength is required to effect the action necessary for union, and to withstand the subsequent suppurations, though these may be prevented or at least moderated by timely depletion. Abscesses are to be opened early, the parts are fomented, and then perhaps poulticed. The limb must all along be kept in a correct position, dead portions of bone must be removed when detached, and the strength supported by generous diet and wine. Opiates are of great use in alleviating the pains and twitchings in the limb. Poulticing is to be continued only for a short time; in many cases it may be altogether superseded by fomentations; and the latter should be used only when abscess is threatened, or when the patient is much pained at one or more parts of the limb. Support and gentle pressure are indispensable soon after evacuation of the matter, when no fresh collection is threatened.

The injury is often so great as at once to demand removal of the limb. There is no alternative, when, from laceration of the soft parts, superficial, deep, or both—comminution of the bone to a great extent—rupture of large vessels—and opening of joints—either gangrene or an overpowering suppuration are rendered not only probable but almost certain. The period at which the operation is to be undertaken requires judicious selection. Some patients are not affected constitutionally even by great and violent injury, such as dreadful laceration of the limbs; whilst others, even after slight wounds, are seized with delirium, tremors, vomiting, lowness of spirits, depressed circulation, paleness of the surface, and appear on the eve either of rapid sinking or of immediate dissolution. In the first class of patients immediate amputation may be had recourse to with safety and advantage. In the second, the patient must be reassured, and stimulated both by external and internal means; in short, reaction must be brought about, and then let the surgeon operate. If he amputate before this, his patient will most probably die on the table, or very soon after his removal from it; reaction will never take place, and sinking of the vital powers be accelerated by the ill judged interference. A greater or less time is required for the occurrence of reaction in different individuals; the usual period is from two to six hours. Commencement of it is a sufficient warrant for operation;

the surgeon must not delay till inflammatory fever has been lighted up, for then he will interfere with great disadvantage. He must then subdue the inordinate action as much as possible, and wait for the suppurative stage. When the patient has become hectic from profuse and long continued discharge, when, perhaps, no union has taken place — then also the limb must be removed. In civil practice, patients as often recover from secondary as from primary amputation. But according to the experience of military surgeons, the result is otherwise — many recover after primary and few after secondary; much may depend on the accommodation of the patient afterwards. A great deal must necessarily be left to the judgment, discretion, and conscientiousness of the surgeon.

Fractures of the cranium were treated of as connected with disturbance of the important organ which it protects.

The *bones of the face* are occasionally broken and displaced. The frontal sinus is sometimes opened by fracture of the external plate. No small degree of force is required to effect this injury: — I recollect an instance of it, with opening into the sinus, occasioned by an attempt at suicide; the man had struck his forehead violently with a large stone, wishing to knock his head to pieces. The integuments are generally divided, and, during expiration, blood, sometimes frothy, is poured out through the opening. When there is no wound of the integument, emphysema of the forehead and eyebrows has resulted from disruption of the bones that compose this cavity, or others connected with the nostrils.

The *ossa nasi* are fractured and displaced by direct violence. They may be broken and comminuted without much displacement, or separated from their connections and depressed without much fracture. Even slight cases are generally attended with laceration of the Schneiderian membrane, and with profuse hemorrhage from the nostrils. The soft parts over the bones are thin and tense, and consequently in many cases divided. Great swelling is apt to ensue, at first either bloody or œdematous. Inflammatory swelling to a great extent, both externally and internally, is to be dreaded and guarded against. Abscess of the Schneiderian membrane, frequently of the septum narium, occurs from slight injuries, if neglected; and, if not actively and properly treated, may terminate in loss of substance and consequent deformity of the features.

The existence of fracture of the ossa nasi is very readily ascertained; the part is distorted, being either uniformly depressed, or hollow at some points, and abruptly prominent and sharp at others. With the view of remedying deformity produced by displacement, and preventing the bad consequences already spoken of, the bones must be restored to their original position. They are to be raised by means of a strong probe or director, covered with lint, and introduced high into the cavity. Whilst, by means of this instrument, pressure outwards is made, the fingers of the surgeon are applied externally, so as to mould the organ into a proper shape. Unless force be again applied to the part, there is no risk of subsequent displacement; no apparatus is required to preserve the bones in situ.

In compound fracture the detached spiculæ are to be picked out, and the wound cleansed of blood and extraneous bodies; its edges are to be brought neatly together, and retained by one or more stitches, with slips of unirritating plaster. Inflammatory symptoms are to be warded off and combated by purgatives, antimonials, local abstraction of blood, and fomentations. Formation of matter in the nasal cavity is to be prevented, by scarification of the swollen membrane that fills the nostrils and precludes the passage of air; and if matter has been allowed to collect, it must be early discharged.

Opening into the frontal sinus, whether the result of accident or of exfoliation, may sometimes be closed by paring the edges of the integuments and bringing them together, or by covering the deficiency with a flap borrowed from a neighbouring part. Such measures should not be resorted to, in the case of opening from accident, till after all inordinate action has subsided, otherwise adhesion will fail.

Cases of fracture of the *superior maxilla*, *os malæ*, and *zygoma*, have been met with. Great displacement cannot occur, nor is any peculiarity of treatment required. If the fracture is compound, loose portions of bone may require removal.

The *inferior maxilla* is exposed to violence, but from its construction and consistence is capable of resisting a great degree of force. It may be broken at various points; the usual site of fracture is where the canine or the first small molar tooth is implanted; but it not unfrequently gives way at the symphysis, or near the angle. The alveolar processes are often detached, with loosening of one or more teeth. The fracture is frequently compound; being produced by a direct blow, as the kick of a horse. The bone sometimes breaks at a part not struck, as at the symphysis from a blow near the angle. The accident is easily recognised; in fact, the patient, if sensible, has himself discovered fracture before he applies for assistance. There is distortion of the part, and the broken extremities, when moved, are felt grating on each other; there is discharge of blood, perhaps of teeth, from the mouth; and in compound fracture the ends of the bone are visible. At the symphysis the parts are not much displaced; they are more so when the fracture is in the site of the first molar. In the latter situation it is occasionally difficult to replace the bone, and retain it in its proper position.

The face swells to a greater or less extent, according to the severity of injury done to the soft parts, and the time which has elapsed before reduction. The parts within the mouth swell; often there is great infiltration of the loose cellular tissue under the tongue. Sometimes extensive abscess forms, showing itself in the mouth or under the chin.

The bone is to be brought to its former shape by pressure of the fingers on the outside, and of the thumbs placed within the mouth on the corners of the teeth. Motion is prevented, and the parts are retained in their proper situation, by a wedge of cork or wood interposed on each side of the jaw, and grooved so as to receive the teeth both above and below. The wedges are placed with their thick ends anteriorly, and are retained by the lower jaw being firmly bound towards the upper ; sufficient space for the introduction of food must be left between the wedges at the fore part of the mouth. Pasteboard or leather is applied externally, cut so as to fit exactly the fractured bone ; it is previously softened in warm water, that it may adapt itself to the shape of the parts, and form a case over them ; a thin layer of tow or wadding is placed between it and the skin, and the whole is retained by a roller, which is preferable to split cloths. The patient should not talk, or in any way attempt motion of the injured bone, and the food given should not require mastication. Inflammation is to be kept down by the usual means, and abscesses, if they form, must be early evacuated. Detached teeth and splinters of the jaw are to be extracted at the first ; if teeth loosen much during the cure, they should be considered as foreign bodies, and removed, otherwise they will keep up the discharge, and tend to prevent union.* From three to six weeks is generally sufficient time for consolidation of the fracture. In severe cases union may be prevented by necrosis of part of the bone ; or, though the bone unite, the external wounds may not heal, and the discharge may continue till the dead portions separate and are discharged.

Fracture of the Spinal Column is attended with alarming symptoms, and often terminates fatally, from the pernicious effects necessarily produced on the spinal chord, either immediately or consecutively, when the bones forming the column are disjoined to any great extent. The injury is effected by great violence — by the body being projected and alighting awkwardly — by a fall on the breech from a height, the head and trunk being bent forcibly forwards — by direct blows on the spine.

Displacement of the bones forming the spine, seldom takes place without fracture to a greater or less extent. Pure dislocation of the spine, from the rupture of ligaments and fibro-cartilage, is a very rare accident ; few cases of it are on record, and in them the injury was in the cervical region ; I have only met with two instances of complete and pure dislocation. The ligaments are of great strength, and the bones yield sooner than they do ; and in the greater number of severe injuries of joints this is the case more or less.

A very well marked specimen of luxation, without the slightest fracture of the fourth from the fifth cervical vertebra is delineated on the next page. The injury was occasioned by the person falling backwards over a high paling, on which he was sitting, and alighting on the back of the head: along with the proper ligaments, the spinal chord is seen to be torn. The patient, of course, did not survive many days, being almost perfectly paralysed.

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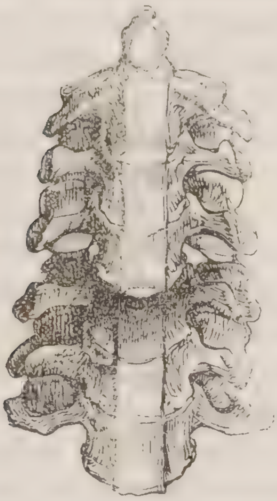
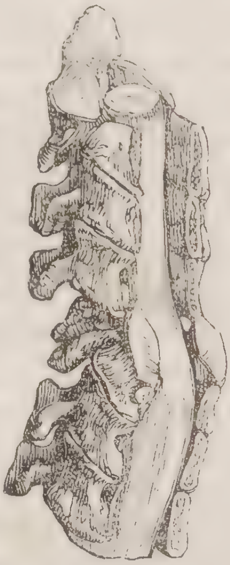
* [In comminuted fractures of the lower jaw, it sometimes happens, in spite of our best-directed efforts, that the ends of the fragments cannot be maintained in contact. Under these circumstances it may become necessary to tie the pieces together by means of a gold or silver wire, or to make the patient wear a thin metallic plate, adapted to the shape of the jaw, and interposed between the cheeks and dental arches ; to the latter of which it should be immoveably fixed.—Ed.]





In general, either the bodies or the processes of the vertebræ are broken, and sometimes comminuted; occasionally the bodies are broken entirely through, with considerable displacement, the upper or lower end, as may be, projecting. There is twisting or bending of the trunk or neck, the articulating processes on one side only being displaced, whilst the ligaments on the other remain pretty entire. In some cases, either the spinous processes, or the articular, are separated without yielding of the bodies of the vertebræ, or of the interposed substance; then there is bending of the trunk forwards.

The symptoms vary according to the site of the injury, and the extent of violence inflicted on the spinal chord. This important organ may suffer concussion without fracture or displacement of the bones; its functions may be consequently more or less disturbed, and paralysis occasioned of those parts that are supplied with nerves from below the injured point. Without fracture, too, vessels may give way within the canal, and by compression from effused fluid urgent symptoms will be produced.

The power of motion may be lost whilst sensation is retained, and *vice versâ;* but in general both are either impaired or destroyed. In one case that came under my care, there was power of motion in one limb and no sensation, whilst in the other there was no motion but the usual sensation.

Patients may recover from the effects of a severe blow on the spinal column and consequent concussion of the chord, but very frequently they do not. Changes may take place at a late period in the chord or its membranes, in consequence of the injury — as thickening of the coverings — bloody, serous, or lymphatic purulent effusion — disorganisation and softening of the medullary matter. Inflammation of the membranes, or of the chord itself, may supervene, either very soon after the accident, or long afterwards; its intensity and period of accession will depend on the extent of the injury, and on the treatment. The muscles act spasmodically, the circulation is excited, the sensorium and nervous system are disordered, delirium ensues, and is followed by paralysis and coma.

In some cases of displacement, even to no small extent, the spinal chord escapes being bruised, torn, or compressed; no bad symptoms may ensue; or paralysis to a greater or less degree occurs and gradually goes off, probably occasioned by bloody effusion, which is afterwards absorbed. This I have witnessed in several instances — in a boy who fell from a high rock — in a woman who fell from a window; both lighted on the breech, and the trunk was bent forwards. The lad remained stout, but his trunk was somewhat deformed by an excurvation; the woman recovered perfectly. In these cases there was evidently laceration of the interspinal ligaments, though probably not of the ligamenta subflava, for the spinal chord must be stretched or otherwise injured when these are torn.

The chord is more or less injured in the majority of cases of fractured spine. If the injury occurs high in the cervical region, immediate death ensues, from compression or laceration of the medulla oblongata. Respiration is arrested by compression or destruction of the chord above the origin of the phrenic and other respiratory nerves. If the chord is injured in the middle of the cervical region, there is paralysis of the upper and lower extremities, with distention of the bowels, and inability to void the urine; the lower bowels have become insensible to the stimulus of distention from want of nervous influence, and the sphincter ani is paralysed. The bladder becomes distended, and then incontinence of urine follows; and frequently there is priapism. The quality of the urine is changed, the secretion of mucus from the bladder is vitiated and increased. Slow inflammation of that organ is induced, the urine becomes bloody and mixed with ropy mucus; lymph is deposited on the lining membrane.

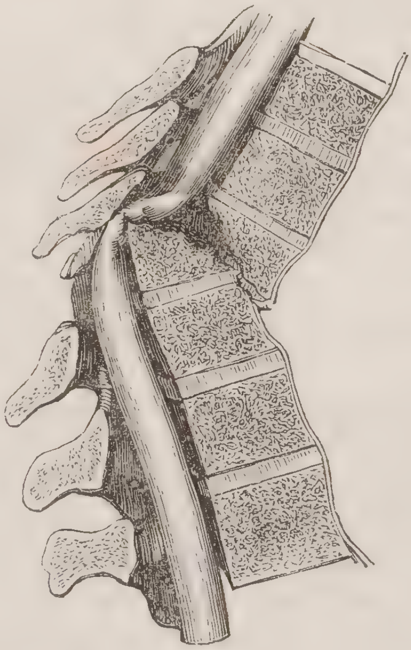
Bruises of the loins often lay the foundation for degeneration and abscess of the kidney, with many of the symptoms of calculus vesicæ, attended with red tongue and hectic, ultimately terminating fatally.

The effects of concussion of the spine are frequently developed long after the infliction of the injury. There is formication, numbness, and difficulty of regulating the motions, in one or more limbs. Still the muscles are not shrunk, nor unable to perform powerful movements; but the patient cannot put his hand or foot to the place he wishes, and cannot support the weight of the body without assistance. Sensation in the limbs is lost to a greater or less degree, their heat is diminished, and it is found difficult to preserve their temperature equable. The symptoms increase till the limbs become totally useless. Along with the lower limbs the bladder is affected, though not always. The urine is not voided with force, and incontinence occurs from distention. Sometimes excitement of the viscus follows; the secretions from its surface are increased, and often mixed with blood. Yet patients survive long under such circumstances, digestion and the other important functions are well performed, and the intellect is unimpaired.

Prognosis in injuries of the spine is unfavourable, as well as in disease of the chord, whether the result of injury or not.

From the treatment much need not be expected; but still no chance is to be thrown away, even in the most unfavourable cases. The attention must be directed towards alleviation of the symptoms. The comfort of the patient must be looked to in regard to the situation of the injured bones and other parts, even where there is reason to believe that the chord is lacerated or completely divided, and that there is no chance of recovery. In less severe cases, by placing the injured parts in their proper position, and retaining them by splints placed along the sides of the spinous processes; — by keeping down inflammatory action, palliating all the symptoms as much as possible, and attending to the state of the bladder if necessary — unlooked for recoveries have taken place.

It has been proposed to treat the spine, in cases of severe and alarming fracture, in the same manner as the cranium — by trephining; and some have recommended this in almost all kinds of injuries. I allude to the practice only to condemn it. The spinal chord is generally displaced and compressed by the lower portion of the fractured body of the bones. One cannot easily comprehend what an operation is to effect in such cases. Further notice of this proceeding is unnecessary, seeing that, as far as I know, it has been unanimously discarded by the profession from amongst the list of surgical operations.



When the patient has borne up against the shock of the injury, and the more immediate consequences, and when partial loss of sensation and motion has supervened, great benefit is obtained from counter-irritation, by blisters, issues, or moxa. But these are not advisable, but to a certainty injurious, till after time has been allowed for subsidence of the immediate effects — for union of the divided parts, and disappearance of acutely excited vascular action. The endermoid application of strychnine is also efficacious in many cases where the injury has been slight — as in the following. A young man was struck on the back of the neck with a leaden plummet. The immediate effects were loss of power and sensation in the whole body. The use of the upper limbs was regained gradually and completely; and when he applied to me, the remaining symptoms were diminished sensation and irregular muscular action in the lower limbs. The mode of progression was very remarkable; supported on the points of the toes and assisted by a staff, he made two or three quick steps as if running, and then suddenly stopped, a few more rapid steps and another abrupt halt, and so on. A succession of small blisters was applied along the sides of the spine in the dorsal and lumbar regions, On the raw surface strychnine was sprinkled, commencing with half a grain daily, and gradually advancing to a grain and a half. He made a perfect recovery in less than three weeks.

In another patient, in whom sensation in one limb without motion, and in the other motion without sensation, remained after severe injury of the spine by a fall from a high window, complete recovery was obtained by the internal use of strychnine, and repeated application of the moxa.

Slow degenerations of the spinal chord are not easily combated with success. Considerable changes of structure have taken place, as shown by the symptoms, before the patient becomes alarmed and applies for relief. He has had a feeling of distention about the lower part of the bowels, and voids his urine with some difficulty; perhaps he suspects stricture of the urethra as the cause. He lifts his feet awkwardly, sets them down clumsily, and all of a piece; his knees totter, there is no feeling about his buttocks, and a numbness round the anus. At length he is for the first time alarmed by incontinence of urine having supervened, or by the limbs having sunk under the weight of the trunk, and by his coming to the ground with violence. The remedial means are local abstraction of blood from over the seat of the disease, followed by friction and counter-irritation. Strychnine may be tried in some cases. But it is indeed seldom that the progress of the case is satisfactory.

Fracture of the Clavicle — This bone is liable to be broken by indirect violence, as by falls on the point of the shoulder, from horseback, or from the top of a carriage; or by a fall with a carriage, the person being inside — of this accident I have met with three or four instances. It may also be broken by direct violence, as by a blow on the bone, or by the person striking it against a hard substance in a fall. It generally gives way about the middle. The fracture, when occasioned by force applied to the acromial extremity, is usually oblique; transverse when the force is applied to the shaft of the bone. The displacement is in most cases great; but when the fracture is at the bend near the scapular extremity,— a not very uncommon accident, — disjunction of the fractured extremities is prevented by the attachments of the conoid and trapezoid ligaments. In ordinary cases, that fractured extremity projects which is attached to the sternum, whilst the scapular portion is depressed and carried inwards. In short, the scapular portion is displaced, the sternal is nearly in situ; though, from the depression of the former, the prominence of the latter appears to arise from displacement. The arm falls forwards and downwards.

The fracture is sometimes compound. The wound is generally small, and occasioned by the projection of the sternal portion; or the integument may be divided by the external force.

The nature of the accident is readily recognised. The deformity is very apparent. There is swelling, from extravasated blood, over the bone; the shoulder is unnaturally approximated to the chest, and depressed. The motions of the extremity, those above the shoulder, are impaired. Crepitation is felt on raising the arm, and carrying it backwards so as to bring the fractured surfaces into contact.

When the patient is seen immediately after the accident, the bones are to be placed in apposition, and retained, without delay, and before inflammatory swelling has come on. No complicated apparatus is required. A pad, firm, though of soft material, and large enough to fill the arm-pit completely, is rolled in a shawl and placed in the axilla; it is retained by tying the shawl over the opposite shoulder, a soft pad being interposed between the knot and the skin to prevent excoriation, and is farther secured by tying the ends under the axilla of the uninjured extremity, which should also be protected by a small cushion. A few turns of a roller, or a handkerchief, are placed round the arm and chest, so as to secure and fix the limb; so the retentive apparatus is completed. The shoulder is thus raised, and removed from its unnatural position; and the fractured extremities of the clavicle, previously placed in accurate contact, are prevented from being again displaced. The elbow and forearm should be supported by a sling, otherwise the unsupported weight of the limb dragging on the shoulder will cause considerable pain, and subsequent displacement will be apt to occur. In order to prevent swelling, it is sometimes advisable to support by a bandage the hand and forearm. The apparatus should be looked to occasionally, adjusted and tightened; and the cushions should be replaced by fresh ones, to prevent excoriation and uneasiness. The bone will be found to lie quite smooth, to remain of its proper length, to unite, generally within twenty days, and that without any unseemly exuberance of callus. No evaporating lotions are necessary. No compresses or splints need be applied over the bone. If the patient be bruised in other parts, and become feverish, it may be requisite to abstract blood and exhibit antimonials, purgatives, &c. But all inflammation, arising from the fracture, subsides on the accomplishment of reduction, adaptation, and retention of the portions. If the fracture be compound, the edges of the wound should be brought together and retained, so as to favour immediate union.

The *body of the scapula* is broken, generally by a severe injury of the chest, as by a hard and heavy body passing over it. There is little or no displacement; and the accident is not easily detected, more especially after swelling has taken place.

It is sufficient to restrain motion; and this is effected by passing a bandage round the chest, over the scapula, and round the arm.

The *acromion process* may be broken off; but the accident is rather uncommon. The fracture is produced by direct violence — a blow or a fall on that point. The spine of the bone also is sometimes broken by a like cause. Portions of the acromion may be separated along with the ligaments connecting the clavicle to it, in the accident of dislocation of the scapular extremity of that bone. The acromion is occasionally broken into fragments by heavy falls on the point of the shoulder.

There is a slight appearance of flattening of the shoulder at first, and then great swelling. Crepitation is felt by pressing gently and alternately with the points of the fingers over the fractured part.

The arm requires to be raised and supported by a sling.

Fracture of the Ribs. — One rib, or more, may be broken by injuries in various ways — by blows of the fist — falls on hard bodies — pressure on the chest by heavy bodies passing over or falling upon it. They generally give way anteriorly to the angles, at the most convex point; but sometimes near the spine or the sternum. At the same time they may be partially luxated at either of the extremities. The fracture is generally transverse; occasionally, and rarely, oblique. Sharp portions are seldom detached. The skin is sometimes divided, but more frequently the pleura and lungs are torn by the spiculæ projecting internally; hence effusion into the chest, and emphysema of the sub-cutaneous cellular tissue near the fracture, take place. The emphysema, if permitted, extends over the greater part of the chest, and even farther.

Fracture of the ribs is attended with pain, particularly during full inspiration; and if the injury is severe, the patient is incapable, without great pain and exertion, of accomplishing full inspiration. He uses his handkerchief, sneezes, and coughs, with the utmost difficulty. Crepitation is felt by the patient, and is easily detected by the surgeon, by placing the hand on the suspected point, and desiring the patient to attempt full inspiration so as to grate the surfaces on each other. Motions of the trunk, and often of the upper extremities also, are attended with aggravation of the symptoms. In some cases attentive examination is necessary to discover crepitus — in certain situations, and when perhaps one rib only has given way, especially if some time have elapsed betwixt the infliction of the injury and the application of the patient for relief.

In the slighter cases, it is sufficient to restrain the motions of the chest by a broad bandage applied firmly round it; and a split cloth, or a scapulary, may be passed over the shoulders and attached to the circular bandage to prevent its being displaced. Great and immediate relief is thus afforded. In those of a plethoric habit, blood may be taken from the arm, some hours after the injury, with relief and advantage; it may ward off an inflammatory attack — and it is absolutely necessary to adopt this practice on the slightest indication of such supervening. The appearance of the countenance, and the state of the pulse and respiration, must be watched; and on the first becoming anxious, the second strong and accelerated, and the third hurried and imperfect, active measures must be employed — venesection, antimony, purgatives, diaphoretics, anodynes — one or all according to circumstances. In the more severe injuries the same practice is pursued; and the symptoms are watched with great care. The air in the cellular tissue, if effused in great quantity about the neck and face, and interfering with the functions of the parts, is to be evacuated by punctures. If the emphysema is slight, and confined to the neighbourhood of the injured part, farther extrication is prevented by the timely and accurate application of a bandage; the air already in the cellular tissue speedily disappears. The effusion into the chest is also in general absorbed; but it may remain and increase, and from violence of action purulent secretion may be mixed with the serous. The breathing then becomes embarrassed, the chest swells, and the integuments are œdematous. The action of the lung is either much impaired or entirely arrested, as is ascertained by auscultation. In such circumstances, evacuation of the effused fluid may be required.

The *Sternum* is sometimes fractured, or, in young persons, the bones composing it disjoined; but the occurrence is exceedingly rare. The displacement is not great; and is rectified by changing the position of the trunk. The same treatment is required as for fracture of the ribs. Abscess has formed under the bone, as the result of the injury; but by antiphlogistic means, local and general, this may be in most cases prevented.

Fracture in the vicinity of the shoulder-joint requires to be most accurately examined, that a correct diagnosis may be formed, and the practice be judicious and decided.

Portions of the upper part of the humerus are torn off, along with the attachments of the short muscles, during violent exertions, particularly if the limb is in an awkward position. This is followed by want of power, great swelling, and considerable deformity. Some indistinct crepitation is perceived; the articulation is afterwards stiff, and the bone of an unnatural form. But these indications of the injury gradually disappear.

More extensive solution of the continuity of the bone takes place, generally in consequence of a direct and violent blow on the shoulder. The patient is unable to raise the arm, though with great pain it can be placed in any position that it occupies naturally; it can be abducted and raised, perhaps to a greater extent and more readily than when sound. The shoulder is flattened, and the limb apparently lengthened. The elbow is readily put to the side. On raising the humerus, rotating it, and moving it to and fro, crepitation is distinctly perceived — but not so readily after swelling has taken place. The swelling also obscures the appearances observed immediately after the infliction of the injury, — the flattening of the shoulder, and apparent elongation of the arm. By the fingers of one hand, pressed deep into the axilla, the head of the humerus can be discovered; and, on rotating the shaft of the bone with the other hand, grasping the elbow and pushing upwards at the same time, crepitation is perceived, and the upper portion of the bone is ascertained to be unaffected by the rotation of the shaft. The nature of the injury is then sufficiently apparent.

But the shaft of the humerus may, by such manipulation, be ascertained to be entire. Still, from the direction of the force which effected the injury, the flattening of the shoulder, the remarkable falling down of the arm, the loss of power, the free motion, and from the crepitation, though perhaps indistinct, it is evident that fracture has occurred. Then, by the fingers in the axilla, whilst the humerus is raised and moved in different directions, crepitation is recognised deeper and less distinct than in the former case; and the surgeon is warranted in believing that the glenoid cavity has suffered — that it is broken into fragments, or that it is separated from the body of the scapula by fracture of its neck; he is also warranted in adopting the means of cure suitable to such an accident. Many such injuries are supposed to occur, yet it is strange that preparations illustrative of it are scarcely to be met with in our collections of morbid specimens.

How both detachment and luxation of the head of the humerus should occur, can scarcely be explained. Luxation certainly cannot take place after fracture; no force can be applied to the head of the bone sufficient to displace it. It is barely possible, that after luxation, force may be applied to the bone so as to fracture its neck. This accident is of very rare occurrence, though by some supposed to be otherwise. I have had an opportunity of examining but one case, and that was very distinct; the head of the bone, completely detached from the shaft, lay in the axilla. Comminution of the head of the bone, with displacement of the fragments, is not uncommon.

Separation of the head of the bone occurs occasionally in young persons, presenting the same appearances and symptoms as fracture of the neck of the humerus in later life. Each, by a little care, is distinguishable from dislocation, even after swelling has supervened. And it is highly necessary that the diagnosis should be correct and prompt, otherwise atrociously cruel and unnecessary proceedings will be adopted, and irreparable mischief occasioned. Luxation is attended with flattening of the shoulder and elongation of the arm, to a greater or less degree, according to the position of the head of the bone. But the elbow does not come to the side, and the motions of the limb are abridged; it cannot be abducted to any extent, if the scapula is fixed. The head of the bone is felt under the pectoral muscle, or in the axilla; and on rotating the arm gently, by laying hold of the forearm, and using it, when bent, as a lever, the head and shaft are found to move simultaneously, all of a piece, and no crepitation is felt. Besides, the history of the accident is an excellent guide towards correctly ascertaining the nature of the injury. If the patient, in falling, have involuntarily stretched out his arm, in order to save himself, and alighted with his whole weight on the palm or elbow, dislocation will most probably have occurred. If, on the contrary, he have pitched upon the shoulder, without any intermediate breaking of the fall, fracture is to be expected.

The evil consequences of false diagnosis, and of treatment formed thereon, are very apparent. A dislocation may be put up and treated as a fracture, perhaps till too late for reduction; and the patient will possess but weak and imperfect motion of the limb, after having undergone long suffering. On the contrary, dreadful torments are inflicted on the patient when fracture is treated as luxation. The force applied with the view of reduction is in all circumstances very painful, but, when exerted on a fractured bone, must prove absolute torture; and during the whole treatment, the fragments are, perhaps, every now and then, by renewed attempts, torn separate, and union so prevented. Severe inflammatory action follows the reductive violence, and is kept alive or regenerated by the loose and projecting fractured ends of the bone; extensive suppurations, attended with fever, ensue, and may destroy the patient. Undetected fracture may also be treated as a bruise of the soft parts only; then every motion of the body and limb is productive of excruciating pain, and there is much risk of uncontrollable inflammation being excited—all which would have been warded off, by placing the bones in a proper and steady position in the first instance; the adaptation of a pad in the axilla is followed by immediate and great relief. Such mistakes are quite inexcusable. By one careful examination,—productive no doubt of considerable uneasiness to the patient in some conditions of the parts—the real state of matters should be ascertained; and then the practice founded on the knowledge so obtained will be followed with speedy cessation, or at least great diminution of pain, and with every probability of restoring the limb to strength and usefulness.

Fractures of the glenoid cavity, of the neck of the scapula, and of the neck of the humerus, are all treated by the same simple, though effectual, apparatus as employed for injuries of the clavicle. It requires to be re-adapted occasionally, to have the parts under the crossings of the bandage, and under the knots of the shawl retaining the pad, well protected by soft pads, and it must be worn for four or five weeks—perhaps, in some cases, even a short time longer. Then gentle passive motion of the limb is to be employed, gradually increased as the painful feelings abate. If the parts are at once placed in apposition, and accurately retained, no abstraction of blood, either general or local, is required at the time, and is not likely to be called for during any stage of the treatment. No cold evaporating lotions are necessary; fomentations are sometimes useful.

Fracture of the *shaft of the humerus* is either oblique or transverse, according to the direction of the force applied. There is considerable displacement. The limb is always shortened to a certain extent, and the natural contour destroyed; the arm is useless, and bent towards the trunk, and the muscles are in a state of spasmodic contraction. The nature of the injury is at once and readily recognised. There is unusual and unnatural mobility of the arm, and distinct crepitation at the fractured point. There is great pain from the pressure of the lower extremity of the bone upon the nervous trunks. The large vessels are seldom torn—though the branches of the humeral artery, and the vessel itself, have in a few cases been ruptured—but there is often considerable bloody swelling in this as in all fractures. Occasionally, when the violence has been great, either the upper or the lower fractured end is thrust through the skin.

When the inferior part of the shaft is broken, there is less displacement than when the fracture is towards the middle of the bone. Fracture above the condyles sometimes extends through them; and the one may be detached from the other either with or without fracture of the shaft. When such an accident is suspected, the position of the condyles in regard to the ends of the bones of the forearm should be accurately observed. Flexion and extension of the forearm can be readily performed, though with pain; not so, when the bones are luxated. Crepitation is detected along the line of fracture, during motion of the limb, and when the condyles are laid hold of and moved upon each other, or on the shaft.

In fracture of the middle of the shaft, coaptation is easily accomplished; slight extension is made by one hand grasping the elbow, whilst, by the other, the bones are brought together, and the straightness and outline of the limb restored. The proper position is readily maintained by two splints of bookbinders' pasteboard, or of leather prepared for the purpose; one applied from over the acromion process to beyond the point of the elbow, the other from the axilla, and also passing over the elbow on the inside; thus the neighbouring joints are fixed, and the muscles rendered inactive. The conjoined breadth of the splints should be sufficient to embrace the limb almost entirely; some space being left, so that when the swelling subsides, they may neither meet, and consequently lie loose, nor overlap each other. They are softened by steeping in hot water, so that they may embrace every part of the limb to which they are applied; and the extremities should be rounded off, to prevent galling of the parts. They are padded with soft flannel, lint, or cotton wadding, or, what is better, with finely carded tow, and retained by a circular roller applied from the points of the fingers up to the shoulder. The binding should proceed from below upwards, to avoid swelling from obstructed circulation, and do away with the necessity of removing the apparatus arising from this cause. It is well to place a wooden splint on the outside, retained by an additional bandage, so as to steady the parts till the pasteboard or leather has dried, and formed a firm mould or case for the limb; then the wood is no longer necessary, and should be removed. The forearm is bent at right angles, and the humerus fixed to the trunk. In simple fracture, there is in general no necessity for interfering with the apparatus until the bandage slackens, in consequence of the swelling subsiding; then, usually at the end of eight days, it is to be reapplied. One splint is carefully raised, whilst the other is kept fixed and the parts steadied, and the limb is ascertained to be straight and of a proper length; if not, then, or even later, the position of the bones may be rectified without causing much uneasiness. The patient need not be confined to bed on account of a simple fracture; he may walk about with the arm supported in a sling.

In compound fracture similar splints are applied, after due attention has been paid to the wound and to the position of the bones. The patient is placed on his back in bed; and the splints are retained by slips of bandage, double, one end being passed through the loop and secured to the other by a running noose. This method of deligation affords facility for the removal of the splints, in order to examine into the state of the limb and dress the wound. It also permits the apparatus being slackened in the first instance during the swelling, and of being afterwards tightened, without lifting the limb or disturbing its position.

Fracture at the distal extremity of the humerus is managed most conveniently with the limb in the straight position. The fragments are placed accurately together, and one splint placed on the fore part, another posteriorly. The forearm is kept in a state of supination. At the end of about twenty days the apparatus should be removed, and the position of the articulation changed if possible. The forearm is to be bent slightly, and a splint applied, — made to fit accurately, and with a joint corresponding to the bend of the arm. This should be occasionally removed, provided consolidation of the fractured bones has advanced so far as to admit of it, and slight passive motion of the elbow-joint employed. Obstinate rigidity of the parts is thus guarded against.

Fracture of the condyles has been already alluded to. It may be farther observed, that the exact nature of the accident is often difficult to detect; in all cases accurate and careful manipulation is required. Displacement of one or other of the bones of the forearm almost uniformly attends this fracture, sometimes rendering diagnosis obscure.

Fracture of the *olecranon* process of the ulna is occasioned by falls on the point of the elbow; or the bone may be snapped asunder by powerful and sudden action of the triceps extensor cubiti, when the arm is much and quickly bent. The injury is readily recognised; there is inability to extend the forearm by its own muscular powers, a considerable space is felt between the separated portions of the bone, and the upper fragment is moveable as well as detached; these marks of the injury are rendered more conspicuous by bending the joint. Crepitation is produced by moving the limb when extended, and the separated parts thereby approximated. Bloody swelling soon takes place, large and extensive when bruising of the soft parts has been great — and this is usually the case, in consequence of the injury being almost always the result of direct violence. In some cases the process is comminuted.

Compound fracture is rare, and likely to be productive of serious consequences. I have treated and witnessed several cases. In one the process was cut off by the patient falling out of bed on an earthenware vessel, which broke under the limb. The joint is necessarily opened. Violent inflammation soon commences, and can very seldom be kept within moderate bounds. Discharge of increased and vitiated synovial secretion takes place, followed by profuse and unhealthy suppuration. The cartilages ulcerate, and then the bones. The cellular tissue around becomes infiltrated, the parts swell and are discoloured, and collections of matter form probably at more points than one; perhaps there is a succession of abscesses. The condyles, and often a portion of the shaft of the bone, are denuded by the suppuration, and superficial necrosis results. Ultimately the patient grows hectic. Amputation had to be resorted to in three of the cases which have come under my observation, at the end of some weeks or months from the receipt of the accident.

Union of the simple fracture will take place by bone, if the portions be retained accurately and permanently in contact; but there is a risk of the joint remaining stiff, and of re-separation being produced by even slight violence. Union by ligament is as rapid as that by osseous matter; and if the ligament is short, the arm is quite as useful. Approximation of the broken surfaces is favoured by extension of the elbow-joint, the triceps muscle being thus relaxed. The limb must not, however, be but perfectly straight. The position is preserved by a splint placed on the fore part of the limb, extending from the middle of the arm to the lower part of the forearm, and retained by a roller applied, not over-tight, from the fingers upwards. The application of apparatus to the separated portion, with the view of forcing it into contact with the shaft of the ulna, is useless. The figure of 8 bandage, and such like, are hurtful. Permanent relaxation of the triceps, with prevention of motion, is sufficient. This is continued for three or four weeks; by that time the fracture will in all probability have united, and then gentle and gradual passive motion of the joint is to be commenced.

In compound fracture the prognosis is always unfavourable. Means must be taken to avert incited action — the limb must be properly placed without delay, the edges of the wound accurately approximated, and antiphlogistic measures pursued. Purulent collections must be opened early. Rest of the joint is to be insured, and support afforded, by bandaging and by the application of a splint. The patient will be fortunate if he escape mutilation by the amputating knife; but when the wound is trifling, and the parts not much lacerated or bruised, and the treatment carefully conducted, a cure may be effected by the same process as the simple fracture.

Fractures of the bones of the *forearm*, of one or both, are common; generally simple. The *Radius* may be broken at various points — at the upper part — near its head — at the middle — most frequently near the distal extremity. At the two first points the fracture will probably have been produced by direct violence; but near the carpus, it is usually the result of force applied to its extremity, as by falls in which the weight of the body is thrown on the palm of the hand. The *ulna* is usually broken by force directly applied, as when the arm is brought in contact with hard bodies in falls. By direct violence also, both bones may give way about the middle, and at corresponding points: or, when force is applied in the direction of the bones, the ulna may be found broken near the wrist, and the radius near the elbow.

When one bone is broken, there is little displacement. The power of motion is lost to a considerable degree, and there is some deformity, but little or no shortening. The existence of fracture is ascertained by tracing the bones with the fingers, and by gently rotating the limb; the broken portions moving on each other produce distinct crepitation. When the radius is broken near its middle, the forearm is kept pronated, and the broken extremities are drawn towards the ulna; by bringing the limb towards the supine position, the ends come together, and the one bone is removed from the other. Fracture of the radius near or through its distal extremity produces displacement of the wrist, with great deformity; and this is increased by bloody effusion into the sheaths of the tendons, and into the superficial cellular tissue. In fracture of both bones, there is much deformity and shortening of the limb; the power of moving the hand is lost; the muscles are bruised and torn, and great swelling soon results.

There is little difficulty in remedying the slight displacement which takes place when but one bone is broken, and in retaining the parts in a favourable position. In children, occasionally, one of the bones of the forearm is broken, the other being bent very considerably, so as to cause great deformity.* When both have given way, slight extension is required, and the forearm is placed in the middle state between pronation and supination. Two pasteboard splints, softened in hot water, and padded with tow, are applied, one on each aspect, from a little above the elbow to over the fingers; the outer should extend to the tips of the fingers, the inner need not pass the palm; they are retained by a roller. In fracture of both bones, a wooden splint should be retained on the outside of the limb for a few hours;

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* [The bones, owing to falls, blows, or other external violence, are occasionally *bent*, with or without partial fracture. Within the last few years a considerable number of cases of this accident have been reported by American and European practitioners. The first regular account of it was published in 1810, by Professor Jurine of Geneva; and in 1821 a very able article on the subject appeared in the American Medical Recorder, from the pen of that distinguished surgeon, Dr. John Rhea Barton, of Philadelphia.

Simple bending is most common in the radius and ulna, though it is by no means confined to them. For obvious reasons it happens only in children, before the completion of the ossific process, or in whom there still exists a predominance of animal matter. In older persons the bones more readily break than bend. The diagnostic signs of the accident are, pain and deformity at the seat of the injury, loss of power in the limb, want of displacement of fragments, and absence of crepitation. The deformity consists in an unnatural curvature, which can be made to disappear under pressure and extension, but recurs, to a certain extent, when the limb is liberated. When attended with partial fracture, the symptoms are the same, excepting that, instead of a curvature, there is angular deformity opposite the seat of the accident. When the injury occurs in the forearm, and only one bone is implicated, extension generally produces no change in the appearance of the limb. The treatment, in both cases, is to be conducted upon the same principles as that of fractures. The attempts to remove the curvature by extension should neither be too violent nor long continued, otherwise they must prove injurious. Mr. Mantel of England, distinguished alike as an able surgeon and an accomplished geologist, thinks that the application of leeches and the usual antiphlogistic means should alone be trusted to when there is much pain and swelling, alleging that the action of the muscles will ultimately restore the limb to its natural form. — Ed.]

but this precaution is scarcely required when but one has suffered. Similar treatment, along with attention to the wound, is required in compound fracture.

The *metacarpal bones* and *phalanges* of the *fingers* are subject to fractures, both simple and compound. The metacarpal bone supporting the little finger most frequently suffers from force applied to the knuckle, as in pugilistic encounters. The other metacarpal bones are occasionally broken from crushing of the hand, as by a heavy body falling on it, or by its becoming entangled amongst machinery. The injury is readily ascertained by moving the fingers, and pressing in the course of the bone. On laying hold of the distal end of the bone suspected to have given way, placing the fingers over the shaft, and attempting slight motion, distinct crepitation is perceived. For the cure, motion of the parts must be prevented for a sufficient time, and inflammation warded off when threatened; there is a little or no displacement, and consequently retentive apparatus can be almost wholly dispensed with.

Simple fractures of the phalanges are recognised and treated by even the most unlearned in the surgical profession. The deformity is so striking as to render mistakes as to the nature of the accident impossible; reduction is accomplished without difficulty; and the bones are kept in their proper places by a small splint, either of wood or pasteboard, placed on each side of the finger, and retained by a narrow roller fixed by glue or starch.

Compound fractures of the phalanges are almost uniformly followed by most violent inflammatory action in all the tissues, terminating in disease of the joints, and in death of the tendinous and fibrous tissues. The suppuration is profuse and unhealthy, and the infiltration of the soft parts extensive. The diseased action not unfrequently pervades the palm of the hand. In the great majority of cases, necessity for amputation arrives sooner or latter.

Fracture of the bones composing the *pelvis* occasionally takes place, but can be produced only by the application of great force, as by a loaded vehicle passing over the body, or by a fall from a great height. The accident is usually attended with serious injury of the viscera contained in the pelvic cavity, or in that of the abdomen; they may be either ruptured, or lacerated by sharp projecting spiculæ, or merely bruised. The nature and extent of the injury is not easily ascertained. There is great pain on motion of the body or of the limbs, and usually extensive extravasation of blood in the soft parts; these circumstances, along with the symptoms that may arise from internal organs which have been injured, and a knowledge of the way in which the injury was inflicted, lead to a strong suspicion of fracture of the pelvis.

A portion of the crest of the ilium may be broken off, without serious mischief ensuing, and may unite favourably. More extensive fractures, deeper in the pelvis, as in the neighbourhood of the acetabulum, are attended with excruciating pain on the least motion; in these the existence of fracture may be suspected from the first, but the extent of the injury is not fully known till after death. Fractures near the symphysis, and of the rami, either of the os pubis or ischium, are usually attended with injury to the bladder or to the urethra. Wound of the bladder is almost necessarily fatal; extravasation of urine, with all its fearful consequences, taking place in the loose cellular tissue connecting the upper part of the viscus to the parietes of the pelvis, and in the cellular tissue behind the peritoneum. The urethra may be lacerated by the sharp edge of fractured bone, or it may be ruptured by direct violence applied to itself. The latter case sometimes accompanies partial diastasis of the symphysis, produced by the person falling astride on a beam. Either injury separately is sufficiently dangerous, and a patient with both is in a very precarious situation. Great extravasation of blood takes place in the perineum, scrotum, penis, and tops of the thighs, infiltration of urine quickly follows, retention supervenes, abscesses form, and the patient perishes under a train of symptoms already detailed when treating of the urinary organs.

The treatment is seldom satisfactory. Absolute rest must be procured, and with this view the limbs are to be secured, and a broad band passed round the pelvis. The state of the viscera must be attended to; collections of matter must be evacuated; and all other untoward symptoms must be actively met, and their consequences either adverted or got over as far as possible.

Fracture of the *Sacrum* is uncommon, as also detachment or fracture of the *Coccyx.* The former accident happens in consequence of a fall from a great height. There is little or no displacement whether the fracture is transverse or longitudinal; sometimes there is splintering of the bone. Acute pain is occasioned by motion of the limbs and of the trunk, and by pressure over the injured part. Abscess is apt to follow, both under the integument, and in the concavity of the bone, and the chief duty of the surgeon is to prevent this if possible.

Fractures of the Thigh.—On account of the thick muscular covering, much attention is required to enable the surgeon to form an accurate diagnosis regarding the effects of an injury of the upper part of the femur. The necessity for ascertaining what the injury really is, need not be insisted on. Consequences dreadful to the patient have too often followed blunders in diagnosis. As in the accidents of the shoulder-joint, some idea as to the exact injury may be formed by ascertaining how the force was applied; but this, alone, may sometimes mislead. Careful manipulation is to be chiefly trusted to.

Fracture within the capsule is met with most frequently in those of advanced age, when the form of the neck of the bone has been altered,—when it has become shorter, and attached less obliquely to the shaft, as is sometimes the case; the bones, too, are then more brittle than in earlier life. The accident often happens from slight force, applied either to the farther end of the bone or to the trochanter, as by a fall in going up or down stairs. Though the height often be not great, yet the patient's energies are weakened, he can make no effort to break the fall, and the weight of the body is thrown on either the fore or the back part of the trochanter. Though the fracture, in such an accident, generally extends beyond the capsule, and the processes are broken to a greater or less extent, yet occasionally the head of the bone is separated by transverse break of the neck without farther injury. This fracture occurs sometimes in those of middle life; and even in children, separation of the head of the bone may on good grounds be supposed occasionally to take place.

The marks of fracture within the capsular ligament are inability to move the limb, pain about the joint on attempts being made to move it, and shortening to a slight extent, as ascertained by comparison with the sound limb; the patient being laid straight on his back, with the crests of the ilia in a line, either the knees or the ankles are looked to, and the comparative length of the limbs thereby observed. In some cases, neither shortening nor deformity is apparent for some time after the accident; there is merely want of power, and crepitation produced by rotation; but retraction of the thigh would after a time inevitably occur, and has done so when the nature of the injury was not at first ascertained, nor proper treatment adopted. Most frequently there is eversion of the toes, and to a considerable extent; sometimes there is inversion, and this is owing to the limb either having been placed in that position in falling, or having acquired it after the injury has been inflicted. The rotators outward are the more powerful; the limb naturally inclines outwards, and when in the recumbent posture, the weight of the foot favours eversion. But in fracture the muscles do not act as in a sound limb; and when the limb is once placed, the patient will not by his own efforts alter the position. Thus it is that inversion not unfrequently happens in this form of fracture, although the opposite state is that which, from a consideration of the muscles involved, is *à priori* to be expected. In inversion the limb presents somewhat of the appearance arising from the most common luxation; but it possesses greater mobility, and has not the want of prominence occasioned by displacement of the articulating extremity of the bone. The facility of lengthening the member, and the crepitation felt on a proper and more attentive manipulation, will remove all doubt.

On examining the injured hip, motion to some extent can be effected, though with excruciating suffering to the patient. On stretching the limb to its original length, and then rotating slightly, crepitation can be felt by the hand, or heard by the ear, placed over the trochanter major.

Fracture is much more frequently met with outside of the capsular ligament, generally passing obliquely through the trochanters, and communicating with fissures in various directions. Splinters are often detached, and sometimes the small trochanter is broken off. Here, also, there is inability to move the joint, violent pain on attempting it, swelling and deformity of the member; there is shortening to a greater extent than in the fracture within the capsule; there is free motion in all directions; rotation, abduction, adduction, flexion, and often extension, can be effected to an unnatural and unusual extent—the degree of motion is no longer limited by the ligamentous attachments of the head and neck of the bone. Here, also, the limb is most frequently everted, but occasionally inverted; and that even when, from the direction and extent of the fracture, neither the rotators outwards nor the rotators inwards have been deprived of the power of acting.

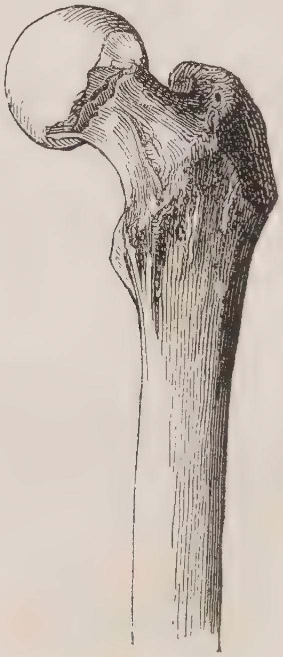
In some cases of fracture, partly within and partly without the capsule, all the usual marks of this injury are present, but it is impossible to move the limb without employing considerable force. This arises from the broken portions being jammed together, the neck of the bone being, as it were, driven into and wedged in the cancellated texture of the trochanter major, or of the upper part of the shaft.

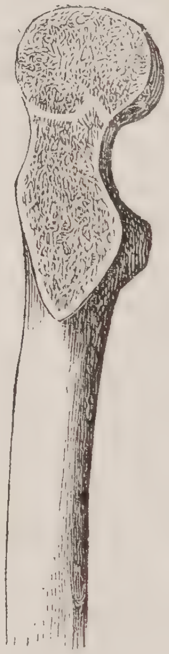
The trochanter major is sometimes, though rarely, detached, without separation of the neck of the bone from its shaft. In this injury there is apparent lengthening of the limb, and flattening of the hip; the patient is able to use the member, though not freely. Before swelling has taken place, crepitation can be perceived on laying hold of the trochanter whilst the limb is in motion; and the trochanter itself is found to be in a slight degree moveable.

Fracture of the upper part of the shaft is attended with immediate and great shortening; the limb is much misshapen, and lies on its outer side, with the knee partially bent. The upper fragment of the bone projects; the resistance to the action of the psoas and iliacus is in a great measure done away with, consequently these muscles raise the upper, whilst the lower end falls back and is drawn upwards behind the other. In mismanaged cases, I have found on dissection the lower end of the bone lying in the sacro-ischiatic notch, and a process advancing very different from reparation — necrosis. The marks of this accident are so conspicuous, that the surgeon is satisfied of what has happened without enquiring for crepitation. Rapid and great swelling takes place, if reduction and coaptation are not soon resorted to; the bloodvessels are torn more and more by the ends of the bone, and effusion of blood into the intermuscular cellular tissue is easy. Very soon more extensive and dangerous swelling takes place, the result of inflammatory action, accompanied with startings of the muscles and greater retraction of the limb.

Fractures of the middle and lower thirds of the bone are not attended with such great risk, and are more manageable in every way. There is less disfiguration — the ends of the bone are not drawn by the action of the muscles so far apart. The fracture is either oblique or transverse, according to the direction of the force applied; and the bruising and the degree of swelling are also dependent on the same circumstance. From transverse fracture fissure sometimes extends, separating one or other condyle.

The reparation of injury in the upper part of the femur is opposed by a variety of circumstances. Fractures of the neck of the bone are almost uniformly met with in those whose powers of life have been nearly exhausted. The whole injury is confined within the synovial capsule, and the fibrous tissues which support that are unyielding, and but slightly vascular; consequently, in fracture of the neck of the femur, there occurs none of the swelling and increased vascularity of the surrounding tissues, which follow fracture of other bones, or other parts of this bone: no temporary callus can be formed; from this cause, support of the disunited parts is deficient. The head and neck of the bone are not so well supplied with bloodvessels as the other parts; those arteries which pass along the ligamentum teres are the chief support. And perhaps the influx of blood is not increased, in consequence of injury, to such a degree as in other parts; in these, when the surrounding parts are bruised or otherwise injured by fracture in their immediate vicinity, their vascular action is soon excited, the vessels ramifying on the periosteum are enlarged, and blood is poured into the bone at all points. Instead of these salutary changes, the secretion of synovia is increased, and a fluid, perhaps vitiated, surrounds the bone, and is interposed betwixt its ends. There is also difficulty in performing accurate adaptation of the broken ends, and in securing retention so long as is necessary for union; the limb has a tendency to retraction; in readjusting the apparatus, when become loose, the broken surfaces are rubbed on each other, and thus any union which may have been in progress is interfered with. In consequence of all this, union seldom takes place by bone; it has occurred, and will occur, in favourabe cases, when the fibrous investment of the neck of the bone does not happen to be torn, and under good treatment. Two sketches which, through the kindness of Sir Astley Cooper, I am enabled to introduce here, show the union complete: the patient from whom this was taken had received other severe injuries, and very little attention had been paid to that of the hip. But it is an undeniable fact, that the circumstances which of a necessity follow fracture at this point are inimical to its effective reparation. The broken ends are sometimes united by fibrous tissue. Most frequently no union takes place, and the broken surfaces gradually become smooth, polished like a bit of china, and adapted to each other; a false joint is formed, but at the





same time the capsular ligament, and tissues exterior to it, are thickened and strengthened, and so the unnatural motion is limited. The rough and irregular portions of the bone are absorbed, and the neck of the femur, from interstitial absorption, almost disappears; its diminished head lies in and is attached to the cotyloid cavity, and is rubbed upon by the opposed surface of the shaft. Shortening of the limb is an inevitable result: at first the power of motion is slight, and the support afforded to the body weak; in course of time the member becomes strong and useful.

Many bones are preserved and exhibited, in which fracture of the neck of the thigh-bone, with bony union, is supposed to have taken place; but there are strong grounds for suspecting that many such have not sustained actual fracture. The neck of the bone may be shortened, and set on awkwardly, and there may be masses of new osseous deposit round the neck and the trochanters. Perhaps the history of the case is known. — An old person sustains an injury of the hip by falling, or by a blow on the trochanter; great lameness ensues, and, after a confinement of many weeks, the patient begins to use the member, which, however, remains considerably shortened. But all this may have taken place, and on examination after death, the parts may have presented the appearances above alluded to, without any fracture. The change in the bone is the consequence of diseased action induced by the injury. The bloodvessels of the bone and its coverings are excited, and new osseous matter is formed at various points; at the same time, interstitial absorption of the cancellated texture of the neck gradually advances, and the bone is consequently altered in length and form. These appearances alone, therefore, do not warrant the confident belief of fracture having occurred, even though the history should seem to favour the assumption. And it ought to be recollected, that mere bruising of the parts about the hip is not unfrequently attended with inability to move the limb, with eversion of the foot, so as to relax the muscles which have suffered, and sometimes with slight apparent lengthening. This change in the form of the head and neck of the thigh-bone is not found only in old subjects. Some drawings from patients under forty and fifty years are given at pages 87 and 88, exhibiting in a remarkable manner this deformity.

In many patients advanced in life, who have sustained fracture of the neck of the femur, there is little, if any, chance of union. In these cases, the application of apparatus with the view of adapting and retaining the parts, is productive of great annoyance, and is apt to produce either ulceration or sloughing of the integuments at various parts; and confinement to one constrained position for a considerable time has a mischievous effect on the general health. Instead, the limb is placed in the easiest posture, either extended and slightly retained, or bent over a double inclined plane formed by pillows, with the knee of the affected side fixed to the opposite; a broad band is passed round the trochanters and pelvis, so as to restrain motion without causing inconvenience; and when pain about the thigh is troublesome, fomentation may be used. After some weeks, when the uneasy feelings have subsided, the position is changed, the patient is set up, and encouraged to move about, supporting the weight of the body upon crutches.

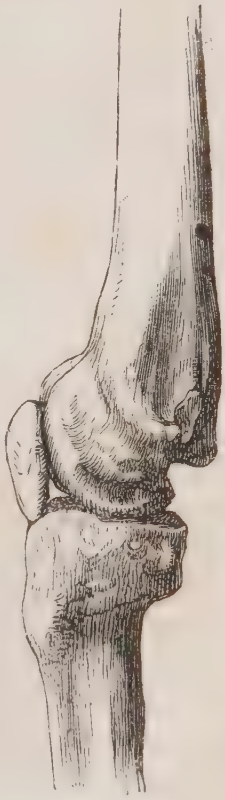
In more favourable subjects, whether the fracture is suspected to be without or within the joint, either entirely or partially, the broken surfaces are to be brought in contact, and retained immoveably in apposition for a time sufficient to admit of union. The limb is put up in apparatus not requiring removal, and but little readjustment. This can be effected only in the extended position. Many splints, with foot-boards, straps, and screws, are intended for this purpose, some to be attached to the injured limb, others to the sound one; but the apparatus which is most simple, and easily procured at all times and in all circumstances, is at once the best and the most efficient. This is a straight wooden board, not too thick to feel cumbrous, and not too thin to be pliable or easily broken; in breadth corresponding to the dimensions of the limb, in length sufficient to extend, from two, three, or four inches beyond the heel, to near the axilla, deeply notched at two places at its lower end, and perforated by two holes at the upper. The splint, well padded, is applied to the extended limb, the ankles being protected by proper adjustment of the pads. The apparatus is retained by bandaging. A common roller is applied round the limb, from the toes to near the knee, so as to prevent infiltration, which would otherwise follow pressure above by the rest of the apparatus. The splint is then attached to the limb by involving both in a roller from the foot to above the knee; and in doing this, the bandage, after having been turned round the ankle, should be passed through the notches, so as to be firmly attached to the end of the splint, thereby preventing the foot from shifting. A broad bandage is applied round the pelvis over the groin, and down the thigh, investing all that part of the limb left uncovered by the previous bandaging. A broad band, like a riding belt, is fastened round the pelvis, so as to bind the splint to the trunk, and thereby keep the broken surfaces of the bone in contact. A large handkerchief, or shawl, is brought under the perineum, and its ends secured through the openings at the top of the board. It is evident that, the splint being thus securely fixed and made as part of the limb, tightening of the perineal band will extend the member, and preserve it of its proper length. By care and attention in applying the apparatus, and in adjusting the cushions about the ankle and perineum, there is little or no risk of the skin giving way. The bandages will require to be reapplied once or twice during the cure, and the perineal band should be tightened frequently. The apparatus is retained for six or eight weeks, the time necessary for union varying according to circumstances. After its removal, great care must be taken at first in moving the limb and in putting weight upon it: it should be accustomed to its former functions very gradually.

The same apparatus in the most effectual for all fractures of the thigh; but those near the distal extremity, and in the lower third of the bone, may be managed tolerably well on the double inclined plane — M'Intyre's splint, the thigh-piece of which is double, the one portion sliding on the other, and made to shorten and lengthen by means of a screw, without removal from the patient. To this the limb is secured by bandaging from the toes upwards; the upper bandage, which should be broad, being continued close to the perineum, and then passed several times round the loins. By elongating the thigh-piece by means of the screw, extension is kept up. Great complaint is commonly made by the patient of pain and stiffness in the knee for a long time after the treatment of broken thigh in the bent position.

There is no possibility of treating fracture of the thigh, with any satisfaction or credit, on the outside of the limb with the knee bent; however attentively the splints are placed, shortening, eversion of the foot, and deformity of the whole limb, are sure to follow. No greater absurdity and cruelty are conceivable than leaving the fracture unadjusted for weeks, making attempts to subdue consequent over-action, and then endeavouring to reduce and retain the bones at a period when otherwise they should have been firmly united. "Experience teacheth" not "fools," and cannot amend those whom prejudice has blinded.

Compound fracture of the thigh, if circumstances do not forbid attempts to save the limb, is to be reduced and retained in the same way as the simple, the wound being attended to, and means taken to subdue inflammatory action. Abscesses must be opened timeously, the limb must be equably supported, and the powers of the system preserved.

The application of force may, in young persons, detach the epiphysis of the lower end of the femur, and displace it to a greater or less extent; and if the accident be not detected, the epiphysis will become consolidated with the shaft in this unnatural position, impairing the usefulness of the member, and probably laying the foundation for disease in or around the articulation. Reduction is easy, and the retentive treatment is the same as that recommended generally for fracture of the thigh near the knee-joint. I have met with one well-marked case of this form of diastasis. A girl sustained an injury of the knee when fourteen years of age, in consequence of the limb having been entangled amongst the spokes of a carriage-wheel in motion; the knee continued painful and swollen, and she had a halt in walking. After the lapse of about three years, extensive suppuration occurred in the lower part of the thigh and round the knee-joint, and amputation very soon became indispensable for the preservation of life. The synovial apparatus was much diseased, and the epiphysis of the lower end of the femur was found displaced forwards and upwards, so that only the posterior part rested on the tibia; in fact, it was turned, as here shown, almost half round on the shaft: firm union by bone had taken place.



Fracture of the *Patella* is generally simple. It is occasioned either by great force applied to the bone directly, or by the action of the strong extensor muscles—the knee being suddenly bent, and the bone snapped across over the end of the femur. The degree of immediate swelling, and of incited action, will vary according to the mode of infliction. When the injury is caused by a blow upon the part, the bone may be broken either transversely or vertically, or both; either the upper or the lower portion may be vertically split, usually the upper; sometimes there is considerable comminution. Muscular action produces transverse fracture only.

The nature and extent of the injury is readily ascertained. The patient is unable to extend the limb, and cannot support weight on it; in the bent position, a space is felt in the situation of the patella, the lower portion is found nearly in its place, but the other is drawn upwards on the fore part of the thigh; by extension of the limb and flexure of the thigh the portions are approximated, and crepitus is perceived when they are brought in contact. These symptoms are perceptible through any quantity of bloody effusion. By attentive manipulation, comminution and vertical splitting may also be detected. The circumstances attending the accident will, in most instances, lead to a tolerably accurate expectation of the state of parts.

The ligament of the patella does not often give way from muscular action; it is much stronger than the bone, and the latter consequently snaps. It may be, and has been, divided, along with the superimposed integument, by a fall on a sharp substance. This accident is followed by lameness, the ligamentous tissue does not soon unite, and the limb is long in regaining its usefulness; sometimes the union is imperfect, and the member remains weak.

Division of the integuments over a fractured patella is a very serious accident. The joint is opened, and such a state both of the limb and of the constitution must in general sooner or later occur as to cause necessity for amputation. Cases have, however, occurred, in which compound fracture of the patella has been cured.

The bone unites, under favourable circumstances, in the same way as any other. In longitudinal fracture there is almost always bony union. In transverse, the obstacles to correct apposition are great; the upper portion is acted on by the muscles on the fore part of the thigh, to a greater or less degree, in almost any position; there is increase and vitiation of the synovial secretion, and when the bones are approximated, this fluid is interposed. The union is therefore almost uniformly ligamentous, and, fortunately, this is as strong and as rapidly effected as that by bone. When the treatment is not of the most approved kind, a long portion of ligament is produced, and the limb remains weak. But union by a short ligament is undoubtedly the most desirable result, the member is as useful as when bone is the uniting medium, and ligament is less subject to disruption; bony union is, for a long time, apt to give way on the application of even slight force.

The fragments are to be approximated, and brought nearly into contact, by placing the limb, with the knee extended, and the thigh slightly bent on the pelvis. The limb is retained in this position by the application of a straight splint behind, hollowed at the extremities, extending from a little below the tuberosity of the ischium to below the middle of the leg, and retained by a roller, not at all tight;

the foot and lower part of the limb must be previously bandaged to prevent infiltration. All apparatus with straps, buckles, and apertures to receive the portions of the bone, are worse than useless. The splint requires to be worn for some time after the patient gets into the erect position, which ought not to be before six weeks after the accident.

Fracture may occur at any part of the *leg*. One or both bones may give way, either transversely or obliquely, according to the application of the force. The transverse fracture is produced by a direct blow, by a heavy body striking or falling on the limb, or by the lower part of the limb being fixed whilst the body is in rapid motion; the oblique is caused by force applied in the direction of the bones — as when a person falls or leaps from a height, and alights on one foot, the limb being extended and the body erect. In the latter description of accident, it is frequently supposed, erroneously, that but one bone has given way; fracture of the tibia perhaps is perceived some few inches from the distal end, whilst the fibula at that part is entire; but, by attentive manipulation, it will often be found that the fibula has sustained fracture, within a short space of its upper extremity; the force was applied to the ends of the bones, and they gave way, each at the weakest part.

The tibia is broken at its upper part near the tuberosity, with or without similar injury of the fibula. There is considerable displacement, particularly in the bent position of the knee; there is no restraint to the action of the extensor muscles inserted immediately above the point of fracture, and these, though not acting with unusual power, cause protrusion of the upper end of the tibia, the condyles of the femur serving as a fulcrum over which the muscles are stretched. This injury is usually the result of direct violence.

Fracture of one bone, at a point lower in the limb, is not attended with much displacement or deformity. Indeed, attentive manipulation is often required to detect the site of the injury; and a sense of crepitation is perceived, only when the lower and upper portions of the bone are pressed on alternately or during rotation of the foot. When both bones are broken, the displacement and swelling are great. The foot is sometimes turned inwards, but usually it falls outwards; and if there has been much laceration of the soft parts, with or without division of the integuments, the lower portion of the limb hangs quite loose.

By the application of great force, as by a rope being twisted round and run tight on the limb, both bones and soft parts may be reduced almost to a pulp, without much or any division of the integument. Such an accident is followed by rapid and great swelling, violent incited action, gangrene, and severe constitutional disturbance. The progress of the mortification is not in all cases uniform; in some, the swelling and discoloration extend to the groin and trunk in two or three days, attended with furious delirium; in others, the disorganisation of the limb is very slow, some days elapsing before it reaches the knee, and in these the constitutional symptoms are less severe.

In some cases there is extensive wound of the integuments, without serious injury of the bone, muscles, or vessels. The skin either has been divided by the external force acting upon the resisting bone, or the sharp fractured end of the bone has been thrust through. Sometimes the bone is protruded to a considerable extent, and entangled amongst the more superficial soft parts.

Fractures of the lower portions of the bones are generally the consequence of twisting and partial displacement of the ankle. The fibula is most frequently broken by twisting of the foot outwards, and the fracture is almost uniformly between two and three inches above the articulation. The broken ends are displaced inwards upon the tibia. The injury is detected by moving the foot, and tracing the line of bone; after swelling has taken place, examination, though almost equally easy, is productive of much more pain, and it is of importance to ascertain the nature of the injury at once, and immediately after the accident. The outer malleolus sometimes gives way from the same cause; or it may be snapped off by a direct blow. The lower portion of the tibia is sometimes longitudinally split by bending inwards of the foot, the patient having fallen from a considerable height; occasionally the inner malleolus is broken transversely. Inquiry as to how the accident happened, particularly as to the direction of the twist, the displacement of the foot, and the degree and extent of crepitation, will determine the nature of the injury.

The astragalus, os calcis, the other bones of the tarsus, and those of the metatarsus, are sometimes broken by the application of great force, but they are not much displaced. Sometimes the foot is violently concussed in consequence of a fall from a height, and though no fracture may have occurred, the patient is equally lame and pained; severe inflammation is sure to supervene rapidly, and may terminate untowardly.

Fracture of the upper part of the tibia is to be treated in the straight position, for it has been already observed, that when the knee is bent the upper portion necessarily projects. A hollowed splint of wood, extending from the middle of the thigh to near the heel, is applied behind, whilst one of pasteboard may be placed on each side: all are secured by bandaging, the foot and lower part of the limb being rolled previously to prevent infiltration; by this simple apparatus, motion of the knee-joint, and of the ends of the bones on each other, is completely prevented; the heel is raised, if necessary, for complete adaptation.

Fractures of the middle and lower portions of the bones are treated most advantageously, whether simple or compound, in the bent position, the angle being made more or less obtuse, according to the degree of flexion most conducive to easy reduction and retention. Extension is made on the limb, and the parts brought into as natural and handsome a shape as possible; in doing so, the appearance of the sound member should be kept in view. There is seldom any difficulty in accomplishing reduction; the extending and counter-extending power need be but slight; the upper part of the limb is steadied by an assistant, whilst the lower is stretched and moulded by the hands of the surgeon. In compound fractures at this part, the portions of bone completely detached from the hard and soft parts are to be extracted. And if reduction cannot be effected in consequence of a sharp and long end of the bone projecting through a narrow wound, either the portion must be abridged by the saw or cutting pliers, or the wound must be enlarged. Sometimes the one mode is preferable — sometimes the other — occasionally both are required. When the protruding portion composes but a small portion of the shaft, though perhaps of considerable length, it should be taken away; when, on the contrary, it is more thick than long, it is better to enlarge the wound; but on this subject no general rules can be laid down. The splint is the same as that recommended when treating of fractured thigh, composed of a thigh and leg-piece, with a moveable foot-board — the double inclined plane, improved by the late Mr. M'Intyre of Newcastle and others. A very simple and efficient apparatus has been used in our hospital for some years back. It answers every purpose fully better than the others, and can be had of all the instrument makers for a third of the expense of those previously in use. The foot-board is fixed so as to make the leg-piece of the proper length, and the splint is secured at a convenient angle. It is padded by means of a cushion filled with oat chaff. The foot is rolled separately; the limb is then raised carefully, and laid down on the splint placed quickly beneath by an assistant; it is retained in a proper position by the hands of the assistant, whilst a roller is carried from the toes round the foot-board, and along the limb to the knee. A broad roller is then made to surround the thigh and splint, and having been turned several times round the loins, is secured to the upper part of the cushion. The limb is thus rendered independent of the motions of the trunk; it is made as of a piece with the splint. It should be raised considerably above the level of the trunk, whilst the patient is in bed, in order, by favouring the return of blood, to prevent swelling and inflammatory action. The wound, if any, is to be approximated. If discharge follow, part of the bandage may be undone from day to day, for the purpose either of employing fomentation or of applying suitable dressing, and still the limb is kept perfectly steady. Abscesses must be opened early — spiculæ removed — constitutional symptoms warded off, and, if they do occur, combated, — at one time inflammatory action must be kept down — at another and more advanced stage, the strength must be supported by all means. In simple fracture it is seldom necessary to undo the bandage, till the apparatus is loosened by subsidence of the swelling — and if the fracture be early reduced, and kept steady, that will be but slight. Then the bandages are undone and reapplied, and the position of the limb attended to. It is seldom necessary to interfere with the leg during readjustment, but should there be any deviation, even considerable, from the proper position, it is easily remedied at the end of the first, second, third, or even of the fourth week; but the sooner the better. The patient may be removed from bed, and may sit up during the greater part of the day, with the heel on a level with the pelvis, within the first week. His health, appetite, and spirits, are thus kept up, sore back is avoided, the tedium of confinement diminished, and the cure greatly accelerated. At the end of five, six, seven, or eight weeks, according to the age, and as the consolidation advances, the patient may be allowed to move about on crutches, some few days after removal of the apparatus, the foot and leg being still bandaged, and supported by light splints, or the bandages may be starched and applied moist, with portions of coarse brown paper interposed. A firm case is thus formed for the protection of the limb and retention of the bones. No weight should be put on the limb for several weeks after, otherwise a leg cured well and straightly may become bent, twisted, and deformed.

Fractures of the lower extremities of the bones, and of the malleoli, are reduced by placing the foot straight, and retaining it so by the application of a wooden splint; the parts are protected by a wedge-shaped pad, and the whole is retained by a common roller. The splint is made to project two inches or two inches and a half beyond the ankle, and to reach near to the knee-joint. It has two perforations in the upper end; to these a bandage is attached by its split end, and it is then carried down along the inside of the splint, and rolled round the foot and ankle; thus the apparatus is prevented from shifting upwards. The other extremity of the bandage, during its convolutions round the foot, is made to pass through notches in the farther end of the splint; the foot is thus turned to the side opposite to that in which it was placed by the accident, and ought to be retained so till consolidation has taken place. The splint is of course always placed on the side of the limb opposite to the fracture.

Disunited Fracture.—In some cases union takes place very slowly. On removing the splints, with the expectation of finding the bones firmly united, the ends can be moved very freely on each other without crepitation or much pain. This, as already stated, may be referrible to various causes,—necessary or accidental evacuations, natural or not—diversion of the nutritious fluids to some particular organ, as in pregnancy—the period of life—a diseased state of the bone of the periosteum or medullary web. By keeping the parts immoveable and firmly compressed for some time longer, consolidation may be brought about. But in spite of every care, the ends of the bones in some cases remain unconnected by any save a soft medium. This happens, however, very rarely under proper management. I have had but one case of it in my own practice, when the patient was from the first under my own inspection and care; and in that the occurrence of false joint was attributable solely to the absurd conduct of the patient. He was tripped up on the street by some individuals following their avocation as pickpockets, fell, and broke his forearm. The fracture was immediately reduced and splints applied—one of pasteboard on each side, with a wooden one exteriorly till the pasteboard hardened. He soon cut away the ends of the splints—within thirty-six hours after they had been put on—so as to allow motion of the fingers and hand, sufficient for indulgence in card-playing. The splints were still farther shortened, and wholly removed much too soon; shortly afterwards he fell from horseback. No union took place by bone. Unless in the case of previous disease of the bone, disunion is generally attributable to some carelessness or recklessness, either of the surgeon or of the patient.

If any osseous deposit has taken place, it is absorbed; the ends of the bone are diminished in size by interstitial absorption; ligamentous or fibro-cartilaginous tissue is formed round the wasted extremities; and the surrounding cellular tissue being thickened and condensed, a sort of synovial pouch is formed, in which the ends, by this time smooth and rounded off, move freely. The limb is shortened in some degree, and its actions are very much diminished in force, there being no sufficient support for the muscles. The bones of the leg and of the forearm are occasionally the seat of false joint, sometimes the femur, but most frequently the humerus.

By the tight application of a firm and broad belt of leather, the part is steadied, and the limb rendered more serviceable. Various measures have been proposed and practised with the view of promoting a salutary increase of action in the parts, by which osseous deposit in sufficient quantity to form a firm uniting medium might be procured. The ends of the bones have been exposed by incision, and removed either by the saw or by cutting pliers; they have then been placed together, retained by proper apparatus, and the case treated as one of compound fracture. The ends have been cut down upon, rubbed over with escharotics, as caustic potass, and afterwards treated as in the former method. Setons have been passed between the ends of the bones, and been retained till sufficient action has occurred; they have been then withdrawn, and the limb steadied by splints and bandaging.

To the last method I would, from some experience, give the preference. It is the least severe, both immediately and consecutively; it is the most readily accomplished, and the most likely to be followed by a successful result. The exact site of the ends of the bones must in the first place be ascertained; the position of the bloodvessels and nerves must be looked to, that they may be avoided; a bistoury is then passed through the skin and down into the substance interposed between the ends of the bones. A strong and sharp needle, fixed in a handle, and with its eye near the point, is passed, in the track of the knife, fairly betwixt the bones, and pushed through the soft parts on the opposite side of the limb. A cord is then passed through the eye, and by withdrawal of the needle the seton is properly lodged. The effects must be attentively watched, and when sufficient action is supposed to have been excited, perhaps at the end of the first week, the cord is withdrawn, and the limb placed immoveable in a proper position. If action is slow in supervening, the chord may be smeared with irritating substances, as the unguentum oxydi hydrargyri rubri, or the unguentum cantharidis, &c. In this manner I have treated false joint in several situations successfully, but I have also been sometimes foiled in effecting my purpose. The seton must not be long retained, the object being to excite action, not to perpetuate discharge, by the profusion of which the end will be effectually frustrated. Much will depend on the period at which the practice is adopted.*

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* [A comparison of the results of the different kinds of treatment of disunited fracture, furnished by Dr. Norris of Philadelphia, in an able and elaborate article in the American Journal of the Medical

Dislocations.— Some joints are so contrived — their composing bones are so notched into one another, and connected by such power-

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Sciences, for January, 1842, leaves no doubt as to their relative value. Of forty-six cases in which the *seton* was employed, thirty-six were cured, three partially relieved, five not benefited, and two died. In twenty-one the seton was introduced with, and in twenty-four without, previous incision: of the former seventeen were cured, two improved, one failed, and one died; of the latter eighteen were cured, one was benefited, five failed, and one died. In reference to the seat of the fracture, the cases stand as follows: —

13	for the	femur,	of which	9	were cured.
10	„	leg,	„	10	„
16	„	humerus,	„	10	„
6	„	fore-arm,	„	6	„
1	„	jaw,	„	1	„

The average period of the existence of the fracture in the above cases was nearly twelve months and a half, the longest ten years, the shortest six weeks. The mean period of the retention of the seton was seven weeks and three days. In one instance — that of a fractured humerus — it was left in thirteen months, notwithstanding which it finally failed. The average time required for the cure was nearly three months, the longest eight months, the shortest three weeks. Arterial hemorrhage occurred in two of the cases; in ten, severe fever, erysipelas, or profuse suppuration.

Of thirty-eight cases in which *resection* was performed, twenty-four were cured, one improved, seven failed, and six died. The seat of the injury was as follows: —

12	were in the	femur,	of which	7	were cured.	
6	„	leg,	„	5	„	
12	„	humerus,	„	6	„	
7	„	fore-arm,	„	5	„	and 1 improved.
1	„	jaw,	„	1	„	

The longest period of the existence of the fracture in these cases was five years, the shortest ten weeks, the average thirteen months and nineteen days. The average time required for effecting a cure was four months, the shortest one month, the longest thirteen months. In seventeen of the cases other methods of treatment had been ineffectually tried: in six the resection was followed by erysipelas, in one by phlegmasia dolens, and in two by profuse suppuration and abscesses.

Of thirty-six cases healed by *pressure and rest*, twenty-nine were cured, one improved, and six failed. The seat of fracture was —

In	13	cases in the	femur,	of which	9	were cured.
„	7	„	leg,	„	7	„
„	12	„	humerus,	„	9	„
„	4	„	fore-arm,	„	4	„

The average duration of the fracture in the above cases was five ful apparatus — and they are crossed by tendons, and tied together by ligaments in such a manner, — that dislodgement can scarcely be effected but by the most violent means. Nothing short of immense force is sufficient, and the displacement is uniformly attended with fracture of portions of the bones, or of their processes. Other bones are loosely joined, permitting free and unrestrained motion in all or in many directions, and but little force, applied in particular directions, suffices to separate and luxate them. In every joint the processes are liable to be broken, and the attachments of the ligaments to be torn off; ligamentous tissue withstands a greater degree of sudden violence than the osseous. The synovial membrane, and the fibrous tissue exterior to it, are almost always torn in complete luxation; but the extent of laceration varies in different joints, according to the direction of luxation and the degree of displacement. The rent may be small, closely embracing the neck of the bone; or there may be an extensive gap on the side opposite to that on which the luxation has taken place. In an articulation surrounded by muscular substance, there is also laceration of this to a greater or less extent. In some individuals, dislocation is very apt to occur, perhaps from peculiar laxity of fibre; and if in any person luxation of a joint has once been produced, the accident is apt to occur again and again from but slight causes.

In general, the mobility of the luxated joint is much diminished;

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months and twelve days, the longest twenty-two months, the shortest four weeks. The mean period required for a cure was nine weeks, the longest nine months, the shortest eighteen days. In one of the cases the treatment was productive of excoriations, in three of severe pain and inflammation.

Cauterization of the ends of the fragments, after free exposure of them by the knife, was successfully employed in six cases; in two others it completely failed. The article most frequently used was the caustic potash. Frictions succeeded in eleven cases.

From a careful analysis of all the circumstances connected with the preceding cases, one hundred and thirty-nine in number, and of which the above is an abstract, Dr. Norris has deduced the following conclusions: — 1. That non-union after fracture is most common in the thigh and arm. 2. That the mortality after operations for its cure follows the same laws as after amputations and other great operations on the extremities, the danger being in proportion to the size of the limb and the proximity of the injury to the trunk. 3. That failures after operations are more frequent in the humerus than in other bones, and in middle-aged and elderly persons than in young ones. 4. That the seton, variously modified, is safer, speedier, and more successful than resection or caustic. 5. That incising the soft parts previously to introducing the seton augments the danger, but renders the cure more certain and expeditious. 6. That allowing the seton to remain in for a long time exposes to accidents, and does not facilitate the cure. 7. That the seton is least successful in the femur and humerus. — Ed.]

the limb is either shortened or lengthened; its contour is changed; the injury is attended with violent pain; the patient is sick and pale; the system receives a shock, from which it gradually recovers after some time. Then swelling, from effused blood, takes place; and this is followed, after some hours, by excited action of the vessels and farther effusion, giving rise to greater stiffness and pain on attempts at motion. If no means are taken to replace the bone, and painful feelings subside along with the swelling, the limb remains long useless, and is the seat of occasional lancinating pains, but at last motion and utility are to a certain extent restored by the formation of a new joint — the head of the bone, and the parts on which it rests, mutually accommodating themselves to each other, by degrees, and permitting a limited extent of motion. *Post mortem* examination, years after the occurrence of the injury, shows change in the form of the bones — the head is flattened, and in the bone on which it lies there is a corresponding depression, formed partly by the deposition of new matter, partly by absorption of the old; in dislocation on the dorsum of the ilium, for example, there is excavation by absorption opposite to the centre of the head of the femur, and round this new osseous matter is deposited so as to form the cavity into a cup resembling the acetabulum. New processes are formed for the attachment of the muscles, and the old are absorbed to a remarkable extent. There are also new ligaments; and a sort of capsule is formed by condensation of the surrounding cellular tissue. The new articulating surface becomes quite smooth internally, and is covered, if not by cartilage, by a smooth substance which answers the purpose tolerably well; the old is gradually filled up and obliterated, the prominences being absorbed, and the cavity occupied by new deposit. These changes do not take place so rapidly as is generally supposed; the cartilage and synovial surface are not much altered for months after the occurrence of luxation; and if replacement be effected, the functions of the parts are soon performed as before the injury.

In some articulations, on account of the formation of the opposed surfaces, attempts at reduction prove ineffectual after the lapse of two or three weeks; in others, of more simple construction, it may be accomplished after some months. The simple mode of reduction is to put the patient off his guard, so that the muscles may be in a state of relaxation, and then to move the limb artfully in the proper direction, without much force. Occasionally, the bone is pulled into its place by the action of the muscles, during the patient's efforts to place the limb in a comfortable position. Considerable force, however, is sometimes required in even recent luxations of large joints, and means must also be taken to weaken the muscular power. The patient, if young and robust, may be bled to syncope, or placed in the warm bath till a sense of fainting supervenes; or an enema of tobacco infusion may be administered, and smoking of tobacco may have the same effect when the patient has not been addicted to the noxious habit; or antimonial solution may be given in nauseating doses. Several or all of these methods may be necessary in some cases, particularly if the dislocation be of long standing. When thus general exhaustion has been procured, counter extension and extension are to be had recourse to. The former consists in having the patient, and the bone next to the trunk, fixed immoveably by fitting lacques and belts; and the latter is made by one or more assistants, or, if need be, with the help of pulleys. During extension, advantage is in many cases gained by lateral force and by rotation of the limb, the bone being thereby moved from its position, and brought within the sphere of muscular action, by which it is drawn suddenly into its proper place. In some cases, there is no doubt but considerable laceration is occasioned by the efforts at reduction, and perhaps this is in some degree necessary to a successful issue — as when the capsule has been slightly lacerated by the accident, and in consequence interposes an obstacle to the head of the bone slipping into its socket. After reduction, inflammatory action in the articulation and its neighbourhood is to be expected, to a greater or less degree, particularly when much force has been employed, and means must be taken to avert this; local remedies are generally sufficient, along with perfect rest.

In luxation of the *lower jaw*, both articulating ends are most frequently dislodged. They can escape in but one direction, forwards into the temporal fossæ; when both are dislodged, the mouth is widely open, and fixedly so, the chin is drawn downwards and backwards. When one is displaced, the jaws are partially opened, the chin is twisted to a side, and immoveable. Great pain is experienced from the pressure of the condyles of the bone on the temporal muscles, from stretching of the fibres of the pterygoids, and from interruption to the functions, by pressure, of the contiguous blood-vessels and nerves. Mastication is impossible, the speech is altered, and indeed articulation may be said to be impracticable.

It is supposed by the vulgar that the accident is particularly apt to happen to infants and young persons. Nurses are in consequence careful, when a child yawns, to support the chin, and pronounce an accompanying blessing. The articulating cavity is then shallow, yet luxation must be rare in young subjects. In my own experience no instance of dislocated jaw has occurred but in adults; and then, either from over-opening of the jaws, or from powerful muscular action during depression of the inferior maxilla.

The nature of the injury is at once known; and the displacement is easily remedied. But I have met with instances where, through ineffectual attempts at reduction, the unnatural position has been allowed to continue for many hours, to the great distress of the individual. The object in view is to depress the ramus — one or both, as may be — and to raise the chin. This is effected by pressure with the thumbs on or in the situation of the molar teeth, whilst with the fingers the jaw is moved upwards and backwards. The thumbs need not be protected by a glove, as is generally recommended; on the bone resuming its place, they are easily slipped into the space betwixt the jaw and the cheek. There is no necessity for bandaging, as retentive apparatus; the patient is not likely to yawn for some time after.

Luxation of the *clavicle*, at either end, is produced by force applied to the point of the shoulder. It is seldom that the sternal extremity is separated from its connexions. When this accident does happen, it is easily recognised; the end of the bone is prominent and loose, and is distinctly felt riding over the top of the sternum. Replacement is effected by bringing back the shoulder; but the bone is with difficulty retained in the proper position, and is long in becoming fixed; a certain degree of deformity is ever after present.

Displacement of the scapular extremity is by no means rare, and occurs to a greater or less extent, according to the laceration of the ligaments. If those only are torn which connect the end of the bone to the acromion, there is mere rising of the end. But if — as is often the case when the violence has been great, as in a fall either from a height or with great velocity — the conoid and trapezoid ligaments connecting the tuberosity of the bone with the coracoid process, have given way, then the end of the bone projects, pushes out the deltoid, and gives rise to considerable flattening of the shoulder. The arm falls forwards, and cannot be moved but with pain; nor is the patient able to raise it by its own muscular power. If the surgeon grasps the middle of the bone, he finds the end moveable; and the evident and deforming projection puts an end to any doubt regarding the nature of the case. The bone is readily reduced by raising the arm, and carrying the scapula backwards. The limb must be retained in the proper position for many weeks, if a cure without interruption, and with as little deformity as possible, is desired; but after the utmost care and patience, there still remains, in almost every case, some projection more than before the accident. The ligaments are slow in uniting, and the union is imperfect and weak. The requisite apparatus is the same as for fractured clavicle, but must be retained for a longer time. The patient experiences great relief from the limb being put up in this manner and maintained so; and inflammatory action, with much of the swelling, is averted.

The inferior angle of the *Scapula* occasionally escapes from under the border of the latissimus dorsi, usually with some laceration of the muscular fibres. The displacement is occasioned by raising the arm above the head to an unusual extent. The angle of the bone projects considerably, and the muscle is felt playing beneath it distinctly during motion of the parts; the movements of the limb are limited and painful. The parts may be brought into their original position by pressing the angle of the scapula towards the ribs, whilst the arm is much raised; and the bone is afterwards confined in its proper place by a broad bandage passed pretty tightly round the chest. The retentive apparatus must be continued for a considerable time, and in some cases a cure may be so effected; but in general the bone soon regains its former unnatural position, and continues to do so, however often and however easily it may be replaced. The parts gradually become accustomed to the change in relative position, and little inconvenience is experienced.

Luxation of the *Shoulder-joint* is prevented, by the arrangement and structure of the parts, from taking place in any direction excepting towards the axilla — downwards into the hollow of the armpit, downwards and forwards under the lower border of the pectoral muscle. Occasionally, though very rarely indeed, displacement occurs backwards. On the anterior and inferior aspects, the articulation is not supported, as at its other sides, either by muscular substance or by processes of bone. The accident is occasioned sometimes, though rarely, by direct violence, as by a blow on the back part of the shoulder; and of such I have seen a few examples. But, in almost every instance, the displacement is caused by force applied to the distal extremity of the humerus; either immediately, as by falling on the elbow, or through the forearm, as when a person endeavours to break a fall by stretching out the arm, and alights with the whole weight of the body on the palm. The accident may also result from forcible abduction of the extremity, particularly when the power is applied near the extremity of the limb. There is laceration, to a greater or less extent, of the capsule, and of the muscles immediately investing the fibrous tissue round the articulating cavity. Without disruption, complete luxation cannot exist — the articulating surfaces cannot be separated, nor can the head of the humerus be altered in position; subluxation, or, in other words, a sprain, may occur in such circumstances, but true luxation cannot.

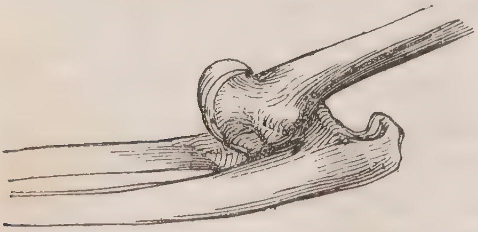
Bruises of the shoulder, with or without fracture, either of the scapula or of the upper part of the humerus, must not be mistaken for dislocation, for the consequences of such a blunder are fearful. In both descriptions of accident, the appearances of the limb are somewhat similar, and hence the examination requires to be particularly accurate and careful. In both there is flattening of the shoulder, but in fracture there is crepitus, motion to an unnatural extent, though painful, and greater suffering during manipulation; in dislocation no crepitus at all resembling that in fracture can be perceived, the motions of the limb are very limited, and the displaced head of the bone can almost always be felt. The direction of the force, too, as already observed, when on the subject of fracture, is an important assistant in diagnosis; from falls or blows upon the shoulder we may expect fracture, from falls on the elbow or palm, luxation. In dislocation an indistinct feeling, sometimes amounting to obscure crepitation, is occasionally perceived during rotation of the limb; and this arises from one or more of the tendinous attachments of the muscles having, during their disruption, torn away a portion of their osseous attachment.

Great pain attends on dislocated humerus, from the head of the bone compressing and stretching the axillary plexus; and the interruption to the flow of the blood produces tingling at the points of the fingers, numbness of the whole limb, and after a time swelling of the hand and forearm. Flattening of the shoulder, and depression under the acromion, are the most prominent marks of displacement having occurred, and are at once apparent. They are more distinctly perceived on comparing the two shoulders; then the acromion on the affected side stands remarkably outwards. The projection is not so apparent when the immediate swelling from effused blood has been fully formed, but the hollow under the acromion can be felt through any quantity of extravasated blood. The arm admits of very little motion, is lengthened and abducted. The elbow cannot be brought close to the side, and attempts to do so are productive of great suffering. The patient has little or no muscular command over the upper arm. Rotation and elevation of the limb require considerable force, and are practicable only to a very limited extent; during attempts at the former, as already mentioned, obscure crepitus is sometimes perceived. The abduction is most remarkable in the dislocation directly downwards; and in this form of the accident, the fingers easily detect the head of the bone lying in the axilla, deep, yet distinct, particularly during attempted rotation. When the head of the bone lies forward by the coracoid process, and under the pectoralis major, it can be felt, and the prominence occasioned by it can be clearly seen in thin people, before swelling has occurred, and after its subsidence. The bone sometimes lodges in an intermediate situation, and then the signs peculiar to each form of displacement are mixed. When reduction is not accomplished, the bloody swelling first occurs to obscure the signs; this may in part subside, but then the inflammatory supervenes; both after a time disappear, the muscles waste, and then all the signs are very apparent. After some weeks, the motions of the limb become more extensive, not in consequence of the head of the humerus having changed its position, or returned into the glenoid cavity, but from the scapula moving on the ribs more freely, and to a greater extent than usual. At last, but not till after a long period, considerable motion betwixt the bones can be effected; the scapula, where the head of the humerus rests, having furnished an adventitious cavity, to which the latter has adapted itself. But free motion can never be regained, for the movements that are effected are chiefly produced by the action of the muscles of the scapula.

Replacement, even in very recent cases, sometimes is accomplished with difficulty in those whose muscles are fully developed. But in general a successful result will follow simple measures, particularly if the patient is taken unawares — as by rotating the arm with one hand whilst the fingers of the other are placed in the axilla, then suddenly lifting the head of the bone outwards, and at the same time performing abduction — the patient being all along assured that he will not be put to pain, and that there is no intention of attempting reduction. In this manner reduction may often be accomplished by the surgeon and one assistant; the trunk and scapula being fixed by the assistant, either grasping the patient in his arms, or holding a sheet or towel passed round the body, close to the axilla, whilst the surgeon extends and rotates the extremity, and at the same time lifts the head of the bone from its situation. The rotation is made by using the forearm, bent to a right angle, as a lever; thus considerable power can be exerted on the head of the bone, and the long head of the biceps muscle — the stretching of which, no doubt, affords an obstacle to reduction — is at the same time relaxed. In luxation downwards, there is no more successful method than that by counter-extension with the heel in the axilla, and extension by the surgeon grasping the wrist. The patient is placed recumbent, on a couch or on the floor, and the surgeon, sitting by his side, lodges his heel in the axilla, and with both hands extends the arm; after a short continuance of extension, he performs a sudden and powerful combination of both movements, and so jerks the bone into its natural position. In some recent, and in all old cases, it is necessary to apply considerable force, steadily, and for a long time, so as to tire out the muscles, and dislodge the head of the bone. An assistant effects this by means of pulleys. These are fixed to a laque, applied above the elbow with a clove-hitch, and to a ring fastened either in the wall or to a post; two small iron rings which can be screwed into a beam are useful in private practice, and should always accompany the pulleys. When all is prepared, the assistant pulls the end of the rope steadily, and with considerable power, whilst the surgeon rotates the limb, and endeavours to lift the head of the bone, at the same time regulating the degree of extension. The directing of the degree and continuance of the force is not the least difficult part of the procedure, for, when excessive, there is a risk of the axillary nerves and artery giving way; such accidents have happened, and been accompanied with serious and even fatal consequences; and from laceration of other tissues, the muscular, fibrous, or cellular, fatal inflammation and abscess have resulted. The surgeon is therefore called upon to exercise judgment and discretion — not to continue extension to a pernicious extent, and not to abandon attempts at reduction too soon, leaving his patient disabled for life. For making counter-extension to the extension by pulleys, a broad strong belt is useful, perforated near the middle for transmission of the injured arm; it is passed round the body so as to fix the trunk and scapula, coming under the axilla of the sound side, and being then fastened by means of a hook to a ring in the wall.

Luxations of the shoulder-joint may be, and have been, reduced after the lapse of two or three months; but the difficulty increases, and the chance of success diminishes, in proportion to the time which has elapsed since the date of the accident. And in deciding upon making the attempt, many circumstances are to be weighed and considered — the patient's period of life and his occupations, the state of the parts, the degree of motion that has been acquired, and the treatment, if any, which has been previously followed. Perhaps the most important consideration is regarding the state of the parts, as indicated by the degree of motion. If the movements be to such an extent as to favour the supposition of the head of the bone having been furnished with a new recipient cavity, to which it has in a great measure accommodated itself, and that the glenoid cavity has, from disuse, become altered, the surgeon can scarcely hope for advantage to his patient from attempts to break up the new articulating apparatus, and reëstablish the old. The patient will, most probably, be put to a great deal of pain and some danger, without experiencing improvement to the limb; indeed the motions and power may prove less than before. In old men, too, force sufficient for reduction cannot be employed without great risk of laceration of nerves, blood-vessels, and muscles. But if the patient be young, the motions still limited, and the articulation apparently not changed by solid effusion, reduction may be attempted with a fair prospect of success, and without injury. In all such cases, however, the surgeon must watch every step of the proceedings, and have sufficient experience to stop short of inflicting irreparable mischief. No standard can be fixed for the degree of force that is necessary and safe; he may be foiled, even after the most powerful efforts, in a dislocation of two or three weeks' duration; whilst, by the use of but slight force, he may succeed in one of as many months. Much assistance is obtained by the means formerly adverted to, as auxiliary, by weakening the muscular energy. Of these, nauseating doses of antimony are most generally employed, and being the most safe, may be recommended to be tried first; and if these fail to produce the desired effect, the patient may be bled freely, if he be young and robust, more especially since this will assist to avert the inflammatory action likely to follow the violent reduction. Tobacco produces the most complete prostration of muscular power, and may consequently be resorted to in extreme cases; but it ought, if possible, to be avoided, as its use is far from being void of danger. The warm bath cannot always be procured; when at hand, it merits adoption, being both safe and effectual, particularly if combined with antimony or bleeding. The extension should not be commenced till these means have begun to take effect, but everything should be prepared, so that it may be applied at a moment's warning. After all attempts at reduction, whether successful or not, it is necessary to moderate the inflammation that ensues, by local bleeding and fomentation, combined, if necessary, with nauseating laxatives: general depletion is seldom required.

Luxation of the Elbow-joint is an extremely common accident, particularly in young persons, before the bony processes have been fully formed. It is produced by wrenches, or by force applied to the farther end of the forearm, the bones neither breaking nor bending. Sometimes, though very rarely, it is caused by direct violence, as in a fall, and then may be combined with fracture of one or both bones of the forearm; but in other circumstances, fracture and luxation can scarcely coexist. In general, both bones of the forearm are displaced backwards, sometimes a little to the ulnar side. The coronoid process occupies the cavity for the reception of the olecranon, and the head of the radius lodges behind the external condyle; the extremity is shortened, and looks twisted; it is slightly flexed, and in the middle state between pronation and supination. Unnatural lateral motion can be produced, but flexion is impracticable, the limb cannot be brought quite into the extended state, and rotation is difficult and painful. Swelling soon takes place, and consequently the hollows are filled up, and the processes of the bones obscured. Yet the olecranon and inner condyle can always be recognised and felt, and their relative position ascertained; the form of the end of the humerus, its hollows, and its prominences, can be distinctly discerned, both before and after the swelling, the soft parts being stretched over the bone; and by rotating



the limb with one hand, whilst the other is placed over the outer and back part of the joint, the situation of the head of the radius is detected. Thus the relations of the bones to one another are discovered; and this must be done at once, whatever pain may be produced by the examination, for it is a saving of suffering in the end. Yet the nature of this injury would seem difficult of detection — a fact scarcely intelligible by any one who is careful in his manipulations, and who possesses common observation, and a sound knowledge of anatomy. Many cases of unreduced luxation are met with; I have seen it in both elbows of the same person; and I have had a dozen of cases, in as many months, of unreduced elbows shown too late for attempts at reduction. The frequent occurrence of such blunders is the more lamentable, as it is almost impossible to replace the bones after three or four weeks; indeed, I have been foiled at the end of two weeks. The parts soon accommodate themselves to their new position, the olecranon process shortens, motion rapidly increases, and the bones get more and more secure in their new relations, — osseous matter being deposited laterally, forming cavities for their lodgement, and new ligamentous matter confining them thereto. After a time, flexion can be made to a right angle; and the limb becomes tolerably useful. By unsuccessful attempts to restore the natural position, inflammation is excited; and thus the salutary processes, commenced by nature for reparation of the displacement, are interrupted and delayed; in young persons such disease of the joint may be produced as might lead to loss of the extremity.

Luxation of the *Radius* alone, backwards on the outer condyle, is sometimes met with; but this bone is seldom singly displaced far from its original site. A hollow is felt below the end of the humerus, on the outer and fore part, and there is a corresponding prominence behind; the head of the bone is found unnaturally moveable on rotation, and this motion is difficult and painful; the arm is extended, presenting a twisted appearance, and flexion is very limited. Extension is to be made, along with pronation.

Sometimes the radius is displaced forwards. The coronoid process of the ulna is occasionally broken off; there is no deformity during flexion of the elbow, but when the limb is extended, the olecranon is drawn upwards.

In luxation of both bones, reduction is much facilitated by position of the arm. The arm and forearm are extended, and the limb is brought well behind the trunk, so as to relax the triceps; then the surgeon performs extension and counter-extension, pulling the forearm with one hand, whilst he pushes with the other placed on the scapula. If the force thus employed prove insufficient, as it seldom will in recent cases, the patient may be placed on his face, on a couch, and on the limb being brought into the favourable position already noticed, counter-extension may be made by the heel planted against the inferior costa of the scapula, whilst the wrist is pulled with both hands. It is seldom necessary to employ pulleys, excepting in cases of old standing; if so, the only peculiarity in their application to this joint is the direction of the force, backwards. And this I consider to be a very material part of the manipulations, for, by attention to it, I have succeeded after previous failures, — after great force had been applied, causing excoriation and swelling of almost the whole limb. In luxation of the radius, backwards, flexion and pronation, combined, if necessary, with extension, will generally effect replacement.

Dislocation at the *Wrist* is very unfrequent. The articulation is naturally strong, admitting of little motion, the bones being accurately fitted to each other, whilst the retaining ligamentous apparatus is both copious and unyielding; on this account greater force is required to effect displacement here than at either the elbow or shoulder-joints, and violence applied to the hands usually causes fracture of one or both bones of the forearm, not luxation of their extremities. Luxation, however, sometimes occurs, either from violent twisting, or from falling on the palm of the hand; and the displacement may be either of both bones or of one. In the latter case, it is almost uniformly the radius that suffers; in the former, the luxation is forwards.

Dislocation of the distal extremity of the radius is generally produced by a sudden wrench or twist. The bone is felt loose and prominent, sometimes riding over the upper part of the carpus. The position of the hand is towards pronation, supination cannot be performed, and, on attempting it, great pain is occasioned. Reduction is readily accomplished, by pulling the palm with one hand, whilst with the other the head of the bone is pressed backwards into its situation.

Displacement of both bones is more frequently the result of a fall on the palm, with the hand bent much backwards. In this case there are two projections, so distinct as at once to mark the true nature of the accident, one anteriorly, formed by the ends of the radius and ulna, the other posteriorly by the carpus; above the posterior prominence there is a considerable depression. Here also reduction is easy; it is sufficient to perform simple extension with one hand, whilst with the other the wrist is moulded into its proper form. The after treatment, however, requires attention, for extensive laceration of tendinous and ligamentous tissue, perhaps combined with fracture of the bony processes to a greater or less extent, must have taken place to admit of displacement; in consequence violent inflammation is to be expected, and means must be taken to avert it. On account of this laceration, also, mere reduction is not sufficient, retentive apparatus must be applied; as soon as the limb has been made straight, a pasteboard splint is to be applied on each side, as in fracture of the forearm, and retained with a roller, a wooden splint being placed exteriorly until the pasteboard hardens. This precautionary measure is also necessary to avert redisplacement in dislocation of the radius singly; in both accidents the apparatus should be retained for at least a fortnight. Afterwards, passive motion, gradually increased and combined with friction, is requisite to prevent stiffness of the joint.

In mere sprain of the wrist, large swelling soon forms anteriorly, from extravasated blood, resembling somewhat projection of the bones, and so leading towards fallacy in diagnosis; indeed it is not unreasonable to suppose that dislocation here does not occur so frequently as is imagined. Fracture also near or through the distal extremity of the radius, an accident formerly mentioned as exceedingly common from falls on the hand, is very apt to be mistaken for luxation. On this account, and because in every injury of the wrist the parts are soon obscured by bloody swelling, there is a strong necessity for early and accurate examination.

Subluxation not unfrequently occurs; in other words, the attachments of the bones of the forearm to each other are broken up, and their extremities separated to an unnatural distance. The accident is distinctly marked by the deformity, the absence of hard projection, and by the unusual space between the radius and ulna occupied by a soft and yielding swelling. Replacement is accomplished much in the same manner as in complete luxation, the bones being compressed towards each other with one hand, whilst extension is made with the other; afterwards splints must be applied and retained.

Compound luxations of the wrist are occasionally met with, and, like compound fractures in this situation, are always troublesome, and often terminate unfavourably. The soft parts are sparing, possessed of little vitality, and much injured by the accident; consequently reparation proceeds very slowly, and is generally superseded by unhealthy and profuse suppuration, perhaps accompanied with more or less sloughing of tendons and integument. If the ends of the bones protrude bare, shattered, and split, they should be removed by means of either the saw or the cutting pliers, previously to attempts at reduction; the wound should then be approximated, and the cure conducted on ordinary principles.

Sometimes a single bone of the *Carpus* is displaced, usually backwards. It is quite loose and moveable, and is easily replaced, but in almost every case redisplacement occurs, the bone at one time occupying its proper situation, at others forming an inconvenient and unseemly prominence on the back of the wrist, diminished by extension, and increased by flexion of the joint. The accident, however, is rare. I have never seen simple dislocation of any of the metacarpal bones.

Dislocation of the *Fingers* is produced by force applied to the extremities of the phalanges; the displacement is always backwards, excepting at the middle joint, where the bone of the middle phalanx is sometimes, but very rarely, luxated forwards. The remarkable projection on the back part of the finger marks the nature of the accident, even to the most careless observer. Reduction is accomplished by extension combined with flexion. In the case of the distal phalanges, it may sometimes be necessary to fasten a cord to the tip of the finger, in order to obtain sufficient extending power. After replacement, the application of temporary splints and bandage is prudent. Compound luxations, however carefully treated, almost uniformly come to amputation.

Luxation of the first joint of the *thumb* is rather an uncommon accident, and is not easily managed. The base of the first phalanx is displaced backwards upon the distal extremity of the metacarpal bone, causing a remarkable prominence on the dorsal aspect, and a corresponding depression on the palmar. The thumb is shortened, deformed, and almost immoveable; the swelling and pain are severe. This displacement is generally produced by the application of force to the point of the thumb, as in falling on it, or in coming against a resisting body with the thumb straight. The deformity is such as at once to apprise even the most inattentive or inexperienced of the true nature of the injury; but the treatment is very difficult and puzzling even in the hands of the best informed surgeons. The base of the bone seems to slip through the lateral ligaments, and remain firmly locked in their embrace; and these being very strong, and in a state of complete tension, defy all usual attempts at reduction. The end of a silk handkerchief, or thick soft cord, is to be attached to the distal extremity of the displaced phalanx, by means of the clove-hitch; and with this extension is made, either by the surgeon alone, or by one or more assistants,—frequently several are required. Counter-extension is made by the surgeon or assistant grasping the forearm, or another handkerchief may be passed betwixt the thumb and forefinger for an assistant to hold on by. The extending force should be made in a direction towards the palm, and almost uniformly requires to be great and long continued, even in recent cases. The bone may occasionally be jerked into its place by a sudden attempt at flexion of the joint, during steady pulling that has been continued for some time. But cases have occurred in which all attempts have proved ineffectual, and it has been found necessary to divide one of the lateral ligaments. From what has been already stated, the reason why this proceeding should facilitate reduction is sufficiently obvious. I had recourse to it in one instance,—one in which difficulty of reduction was not to have been expected. The accident was very recent, not an hour had elapsed; the patient was an old man, and very drunk; no resistance to the reductive measures could have been offered by muscular energy; yet very powerful force was applied and persevered in without avail. At last the external lateral ligament was divided by the point of a very narrow and fine bistoury, and then replacement was immediate and easy. Some inflammation followed, but was kept within bounds, and the man regained the use of the articulation. In other cases, again, the bone is replaced by the use of but very slight force, provided it be applied, as already stated, in a direction towards the palm of the hand. The last phalanx is equally liable to luxation in the thumb as in the fingers, and has no peculiarity of treatment.

Luxation of the Hip-joint.—The great strength of the ligaments, the depth and fitness of the body and cartilaginous cavity for the reception of the head of the bone, and the great power of the muscles surrounding the articulation, render dislocation here both difficult and rare. The accident is generally produced by great and sudden force, applied either to the distal end of the femur, or to the farther extremity of the limb, as by falling from a considerable height, by the foot slipping whilst the person is supporting a heavy weight, by falls from or with a horse, &c. The luxation, in a great majority of cases, takes place upwards and backwards, the head of the bone lying on the dorsum of the ilium. The limb is shortened to the extent of from an inch and a half to two inches and a half, the toes are turned in, the thigh is slightly bent upon the pelvis, and very firmly fixed. Before swelling has occurred, and also after it has subsided, the head of the bone can be felt lying under the gluteus. The trochanter is evidently out of place, being depressed, and lying farther up and back than usual. This is strikingly observable on comparing the injured limb with the opposite. Attempts to move the limb and effect rotation produce great pain. Large swelling soon follows, along with greater stiffness and immobility. If the head of the bone is not replaced, the pain gradually subsides, and, after some months, freedom of motion is regained to a slight extent; the patient is able to walk, but with a great halt.

At first, reduction is accomplished with no great difficulty. Within a very short time after the occurrence of the injury, before the patient had recovered from the shock, whilst he still lay sick, faint, and powerless, I have succeeded in effecting reduction of the femur quite unassisted, — extending with one hand, grasping the thigh behind, and, at the same time, rotating it outwards by pressure of the forearm on the leg, counter-extension being made by the left hand on the symphysis pubis. When a few hours have intervened, assistance and apparatus are requisite. The patient is secured by a broad band, — a common sheet suits very well, — passed under the perineum. The lacque is fixed above the knee, with a knot that will not run, a towel wrung out of cold water being applied next to the skin, in order to increase the security of the hold and prevent excoriation. A well-padded broad iron ring, tightened on the limb by a screw, and provided with suitable straps for attachment of the pulleys, is very useful, — fully more convenient than the common woollen lacque. Extension may be made by one or more assistants; but this may prove ineffectual, and it is better at once to have recourse to the pulleys: these are not alarming to the patient, and, being efficient, will in the end materially diminish his suffering. The extension should be gradual, steady, and persevering; the rotation of the limb during extension should be principally outwards, effected by laying hold of the ankle, and using the leg as a lever. This motion is peculiarly successful when the bone has yielded a little to the extension, when it has changed its place, and come nearly on a line with the cotyloid cavity. In some cases, even of no long standing, auxiliary means are required, — bleeding, antimony, &c., as formerly noticed. In old cases, no attempts at reduction should be made until the patient has been brought into a relaxed state, approaching to collapse, by one or more of the auxiliary means, and by such as are best suited to the particular circumstances of the case; in such instances also the extension, rotation, &c., must be persevered in for some time, — they are not at once successful. Frequently, particularly in recent cases, reduction is accompanied and indicated by an audible and perceptible snap, occasioned by the head of the bone slipping into the cotyloid cavity; the motions are again readily performed, and the limb resumes its proper length and shape. The muscular and articulating apparatus must be kept quiet for some time afterwards; a band should be passed round the knees, and the patient strictly confined to the recumbent posture; at the same time, fomentations are to be used about the joint, to the perineum, and to the part where the lacque was applied. It is rarely necessary to have recourse to abstraction of blood from the neighbourhood of the articulation.

There is no great risk of the bone again escaping from its situation. I have but once witnessed such an accident. A female suffered luxation of the hip nearly a month previously to her admission into the Royal Infirmary, and reduction was unavoidably deferred for three days more. It was accomplished without difficulty, and the usual precautions were afterwards adopted; but next day it was discovered that luxation had again taken place. The patient had cunningly contrived to have ardent spirits brought to her, and indulged freely in these, got out of bed, and slipped down. Replacement was again effected, more easily than before; the limbs were firmly secured to each other, confinement to bed and no farther indulgence in liquor were strictly enjoined, and after thirteen or fourteen days the limb fully regained its functions.

Luxation of the hip downwards and forwards, the head of the femur lying in the thyroid foramen, is generally produced by a fall under a heavy load, the thigh being at the same time forcibly abducted. I have also seen it occasioned by a fall with a restive horse. The limb is elongated considerably, and advanced a little forwards; the trochanter major is depressed, the toes are inclined neither outwards nor inwards; the limb is immoveably fixed, and this most unequivocally marks the nature of the accident.

The limb is lengthened when the trochanter major is split off, as also when severe bruise of the glutei has been inflicted without breach of continuity in any part of the bone, and without displacement. In the first stage of morbus coxarius, too, a somewhat similar appearance and position of the limb is presented; there is lengthening, but then there is also more or less wasting of the muscles, more mobility than in the dislocation, and a marked history attached. Complicated cases occasionally occur — as when a patient who has been labouring under hip-joint disease, perhaps not in an aggravated form, falls heavily, and on being lifted up is found to be incapable of moving the joint, the limb at the same time being elongated, and having a distorted appearance. An instance of this nature impressed strongly upon me the great necessity for accurate diagnosis in the first instance, and that such was to be acquired only by taking every circumstance into consideration. A young man was engaged in cleaning a slaughter-house, standing on two blocks of wood with his legs considerably apart. One of the blocks suddenly slipped from under him, and he fell with his limbs spread. He was carried home in great pain, and next day I was asked to visit him. The limb was elongated, and the hip flattened; the joint was stiff, and attempts at motion produced great pain; but by perseverance the limb could be put in various positions, and the trochanter was not so much depressed as in luxation downwards. By cross-examination it was discovered that the patient had halted in walking for many weeks previously, had felt as if the limb was longer than the other, had pain in the groin and knee; in fact, morbus coxarius had been advancing, and the pain, immobility, and greater elongation had been occasioned by the fall, causing violent excitement of the morbid action previously in progress. Dreadful consequences must have resulted from mistake in diagnosis and practice founded upon it. I have observed, in other cases, great and rapid elongation of the limb in consequence of injury to the hip-joint previously diseased; and I have known instances in which persevering and forcible efforts were made to reduce the supposed luxation.

The reduction is in many cases difficult. In young and muscular individuals, after the lapse of some hours, when reaction has occurred, the muscles are rigidly contracted, and the head of the bone is not easily dislodged. Extension, made to a certain extent and continued, is not so useful or essential here as in other forms of luxation of this joint. Adduction, carrying the injured thigh quickly and forcibly over the other, is generally successful; and the reduction is favoured by at the same time raising up the neck of the bone, by means of a towel or wooden roller passed under the upper part of the thigh. There is also no such advantage from rotating the bone as in other luxations. It is very often necessary, even in recent cases, to adopt measures to weaken muscular exertions; and again, in cases of three weeks' duration, I have found no difficulty.

The head of the bone, when dislodged from the foramen obturatorium, may slip past the cotyloid cavity, for it is impossible to regulate its direction; it comes to be acted upon by muscles which have been displaced, some being compressed and partially paralysed, whilst others are excited; they have been put out of their usual condition and relation, and act irregularly. The head of the bone may, from this cause, get into the sacro-ischiatic notch. This has occurred to me; but I have found no difficulty in removing it from thence, and effecting reduction satisfactorily.

Displacement into the sacro-ischiatic notch is attended with great and remarkable inversion of the toes, slight shortening of the limb, the prominence of the head of the bone felt under the gluteus maximus. It is the least common form of luxation. Reduction is attempted by extension and rotation outwards, at the same time pulling the head of the bone towards the acetabulum by means of a towel passed under the thigh.

Luxation of the head of the femur on the pubes is perhaps more frequent than any other, excepting that on the dorsum of the ilium. The limb is not much shortened, the toes are everted, the trochanter major is depressed, and nearer to the anterior superior spinous process of the ilium than usually, and the head of the bone is both seen and felt prominent in the groin. Much pain, swelling, and sometimes more or less paralysis of the limb, are occasioned by this displacement; the femoral artery and vein lie immediately interior to the head of the bone, and are compressed, and the crural nerves are stretched over it. In attempting reduction, rotation inwards should be employed during extension, accompanied with endeavours to lift the upper part of the bone towards the acetabulum.

[*Congenital Luxation of the Hip-joint* is sometimes met with, though on the whole a very rare affection, especially in this country. Female children are more apt to suffer from it than males, and it is also more common in such as are of a scrofulous habit than in such as are endowed with a good constitution. Of twenty-six cases of this malformation observed by Dupuytren, not above three or four were males; a disproportion probably not altogether dependent upon chance. The immediate causes of this variety of displacement are, first, shortness, total absence, or extreme obliquity of the neck of the thigh-bone; secondly, partial or entire obliteration of the cotyloid cavity; thirdly, deficiency, extraordinary elongation, or complete absence of the round ligament.

The characters of this malformation are, shortening of the affected limb, unnatural projection of the great trochanter, ascent of the head of the femur into the iliac fossa, inversion of the leg, and obliquity of the pelvis. The motions of the joint, particularly those of abduction and rotation, are constrained and imperfect; the muscles of the upper part of the thigh are retracted, or drawn towards the iliac crest; the limb is thin, wasted, and out of all proportion to the rest of the body; the tuberosity of the ischium is almost uncovered, and consequently unusually prominent; the upper part of the trunk is thrown backwards, while the lumbar portion of the spine projects forwards, being concave behind; the pubes is placed almost horizontally on the thighs; and the ball of the foot alone touches the ground when the child stands erect.

In the recumbent posture, when the weight of the trunk is taken off, and the muscles are relaxed, most of the symptoms of the luxation disappear, and the limb may be shortened or elongated at pleasure. In walking, the body is inclined towards the sound side, and the head of the dislocated bone sinks towards the cotyloid cavity by its own weight. As age advances, the limb becomes shorter, in consequence of the femur ascending higher and higher on the ilium; the obliquity of the pelvis augments; and the power of locomotion, already so much impaired, is completely destroyed.

Congenital dislocation of the hip-joint may, in general, be easily distinguished from other accidents or maladies, by the affection being observed at or soon after birth, by the obliquity of one or both thighs; by the absence of pain, swelling, and ulceration; by the head of the femur being displaced without any external violence; and by the ability of the surgeon to lengthen or shorten the limb at pleasure. In disease of the hip there is always more or less pain, with a feverish state of the system, and gradual failure of the strength; the parts about the joint are tense and swollen; the limb, at first somewhat lengthened, becomes afterwards shortened, and cannot be extended without the greatest suffering; and the motions of the ileo-femoral articulation are forever impaired.

The *post-mortem* appearances vary. In general the cotyloid cavity is partially obliterated, or entirely deficient, being replaced by a small, irregular, osseous prominence, devoid of cartilage and synovial membrane; the head of the femur, often flattened at its antero-internal aspect, rests in a sort of superficial fossa on the dorsal surface of the ilium; the round ligament, as was before remarked, is elongated, partially worn away, or even altogether absent; and the surrounding muscles are either atrophied, transformed into a species of yellowish fibrous tissue, or preternaturally developed. In the latter case, their action is preserved; in the former, it is very much restricted, or totally impeded.

The prognosis is always unfavourable, as the patient dies either young, or remains permanently lame and deformed.

The treatment can be only palliative; and as the weight of the trunk is the main agent in aggravating the displacement, repose is obviously indicated: but it is not necessary to confine the patient to the recumbent posture; since, in the act of sitting, there is no stress on the femur, the body resting principally on the tuberosities of the ischia. Dupuytren thought favourably of the cold bath: it should be strongly impregnated with salt, and the body immersed for three or four minutes at a time. He was also in the habit of using a well-stuffed belt, about four inches wide, for surrounding the pelvis and fixing the great trochanters; thus binding the ill-adapted parts together, keeping them at the same height, and preventing that continued motion to which they are otherwise so much exposed.]

Luxation of the Bones of the Leg — separation of them from the end of the femur — seldom occurs. It can be the effect only of great violence and great laceration. Most frequently fracture is concomitant, perhaps with wound; and such accidents require amputation, either primarily or secondarily. Sub-luxation, from laceration of the internal lateral ligament, is not so unfrequent. It is most common in females, the natural conformation of their thigh-bones disposing them to bend inwards; and from falling awkwardly, particularly if carrying a weight, the ligament is apt to give way. The limb is pained, deformed, and unable to support the body, and swelling to a considerable extent soon follows. Reduction is extremely easy; and the parts are retained in site by the application of a wooden splint, to either the outer or the posterior side of the joint, the leg and foot being previously bandaged. The joint remains long weak, and never recovers entirely; a sustaining apparatus, fitted on the outside, retained by straps, and with a joint opposite to the articulation, is required to be constantly worn when the patient wishes to use the limb.

Luxation of the Patella is spoken of by some as common. Others of much experience have not met with a single instance of it. I have never seen this accident. The bone, it is said, may be displaced outwards, inwards, or upwards. The first form of luxation is the most frequent, and is caused by a severe fall, with the foot twisted outwards and the knee inwards. Displacement inwards is produced by direct violence applied to the outer part of the bone, or by the foot being turned inwards in a fall. Displacement upwards can occur only after laceration of the ligamentum patellæ, the bone being then drawn up by the unresisted action of the muscles on the fore part of the thigh. In dislocation outwards, the bone has been found "resting with its inner edge upon the outer surface of the condyle, the fore part facing obliquely forwards and inwards." In this last form of accident, sudden, forcible, and complete flexion of the limb is said to produce immediate reduction. In dislocation outwards or inwards, the muscles are to be relaxed by raising the heel, extending the limb, flexing the thigh, and then forcing the bone to its proper site by manipulation. In the dislocation upwards with rupture, the limb is to be kept extended and raised, and the bone is brought as nearly into its place as possible by bandaging. When a peculiar laxity of the apparatus about the joint exists, whether as a cause of luxation or not, the support of a well-made knee-cap is required.

As formerly stated, *Dislocation of the Ankle* cannot take place inwards or outwards, without fracture of the end of the tibia or of the fibula, either above the articulation, or where they project by the sides of the astragalus for the greater security and strength of the joint. Subluxation, however, or sprain, may occur without injury of the bones: in this accident, should the parts not have spontaneously resumed their original situation, no difficulty is experienced in putting them to rights; simple manipulation is sufficient. Occasionally, the foot is luxated forwards, by force applied either to the heel or to the fore part of the leg whilst the limb is fixed. The heel is shortened, the foot elongated; indeed, the marks of the injury are so distinct, that comparison of the limbs is sufficient for diagnosis. Luxation may also take place backwards; and in this case the heel is elongated and the foot shortened. In these accidents it is not unfrequently found that one or other malleolus has given way, or that the lower end of the tibia is split. Reduction is sometimes difficult. Extension is to be made by grasping the foot and pulling whilst the limb is fixed, at the same time making pressure either backwards or forwards, as may be required. To retain the bones in their proper situations, it is always necessary, at least prudent, to apply a pasteboard or leathern splint to each side of the limb, particularly when fracture of the malleoli is conjoined.

Displacement of the Bones of the Tarsus may result from great force; for example, when the foot is squeezed under a heavy weight, one or more bones may escape from their connections, and project. Reduction of such displacement is exceedingly difficult at any period, and becomes almost impossible when inflammatory action is allowed to supervene previously to attempts being made. The astragalus is sometimes pushed out of its place; though it is difficult to conceive how, to a bone so hid and so firmly connected, such force should be applied as to cause protrusion of it from its natural situation. It has been found lying on the dorsum of the foot, causing swelling, lameness, great pain, shortening and deformity of the limb; and the shape of the bone can, in such circumstances, be distinctly felt and seen through the integument. As already observed, reduction is almost impracticable, and, with the view of remedying deformity, it has been proposed to cut out the displaced bone; but as to the expediency of such practice I can give no opinion.

I have seen but one instance of displacement of this bone backwards, and most probably another will never occur to me. A heavy young man, in a state of utter intoxication, fell backwards down a stair, and in the fall his foot became entangled in the railing. The astragalus was found lying betwixt the back of the tibia and the tendo-Achillis, its upper articulating surface facing forwards, the lower in contact with the tendon. All attempts to reduce the bone proved fruitless. Violent inflammatory action followed, but was reduced by active measures; and the limb ultimately became very useful; in fact, though not till after many months, little lameness or shortening was perceptible.

By *Sprain* is understood subluxation or partial displacement of a joint, with stretching, and more or less laceration of the articulating apparatus—ligaments, tendons, sheaths, and bursæ, being all involved in the injury. Sometimes small portions of the processes of bone are separated, being torn away, attached to ligament or tendon. All joints, both large and small, are liable to the accident. In the proximal, or in the middle joints of the finger, for example, one or other lateral ligament is stretched or torn; the finger is twisted to a side; the joint is swelled; and this swelling, with pain, is of long continuance, perhaps increased by repeated twists, or by imprudent use of the joint. The elbow and shoulder are frequently sprained, as also the hip and knee; but the injury most frequently occurs in the wrist and ankle. It is generally occasioned by a fall, the foot or hand coming awkwardly to the ground, the muscles being at the time relaxed and unprepared; by over-exertion in lifting heavy weights; by entanglement and twisting of the limb, &c. The ankle is often sprained by what is called a false step; the fore part of the foot comes in contact with an obstacle unexpectedly, the foot is twisted under the limb, the weight of the body is thrown on the apparatus of one side of the joint, and this is in consequence immoderately and unnaturally stretched. Violent pain immediately occurs, and the patient is sick and faint. Discoloration and rapid swelling take place from extravasation of blood into the cellular tissue, into the sheaths of the tendons, and perhaps into the synovial pouches, in consequence of laceration of the bloodvessels. Effusion of serum and increased secretion of synovia afterwards occur, from incited action of the vessels. Thus the joint is deformed. Attentive examination is required to guard against mistakes; the existence or non-existence either of displacement or of fracture must be at once ascertained by determined and perfect manipulation; the parts must be pressed and moved, to such an extent as is necessary, notwithstanding the pain thereby occasioned, and notwithstanding the resistance afforded by the patient. It has been already stated that luxation of the wrist is not uncommon; that separation of the one bone of the forearm from the other, and transverse fracture or splitting of the radius, at the distal extremity, are accidents by no means rare. Great disfiguration follows simple sprain, much swelling taking place on the fore part of the limb from effusion under the fascia, and there is also much serous and bloody infiltration of the cellular tissue on the back of the hand and forearm. In the ankle, the ends of the bones must be carefully examined, and also the fibula in its whole extent, that the existence or non-existence of fracture may be ascertained, and that the surgeon may be guided to a correct mode of treatment. If the joint is not put at rest immediately, the extravasation is increased, and, in consequence, the pain and inflammatory swelling also; and parts of the joint at first not involved in the injury may thus be made to suffer. Many diseases of synovial membrane and articulating cartilages are attributable, and can be traced, to badly managed sprains; and in some constitutions, but slight injury, combined with a little bad treatment, suffices to destroy a joint. When the case is well managed, the pain is never great, and soon abates; the swelling after a few days slackens; the discoloration becomes greater, the serum being absorbed, and the effused blood shining through the skin; the integuments appear green, blue, red, purple — these hues either being present all at the same time, or occurring successively; the discoloration often extends far from the joint. The mobility and strength of the joint are recovered gradually.

Perhaps no injury is more frequently mismanaged, by those both in and out of the profession. Every old woman thinks she can cure a sprain; most absurd and hurtful measures are resorted to; the injured parts are kept in motion; cold lotions and cold effusions are employed, and at the same time stimulating frictions: probably attempts are made, either by leeching or by puncturing, to extract the effused blood; and many similar follies are committed. The proper treatment certainly appears to consist principally in absolute rest and position. If there is any displacement it must be rectified immediately. If there is any fracture; or if there is a tendency to redisplacement after reduction; or if the patient is restless either from folly or from insensibility, as when the head has been injured by the accident, when the patient is under the influence of strong liquors, or when he labours under delirium tremens, — a splint or splints must be applied to secure immobility of the parts, at the same time without such compression as may interfere with swelling from effusion; the effusion is a salutary process, and should be encouraged, not repressed. By absolute rest and elevation of the limb, the extent of the swelling is limited, and inflammation warded off. Fomentations, properly employed, afford much relief; at first they probably encourage the serous effusion. The integuments soon become relaxed, during the regular use of fomentation, and tension and vascular action subside, as also pain. The swelling then abates, and is no longer hard; it pits on pressure, and the skin has a puckered appearance. Then gentle friction becomes advantageous, and uniform support should be afforded by the application of a flannel roller. The longer the limb is disused, the more perfect and rapid is the recovery, provided the rest of the cure be properly conducted. In general nothing more than what has been stated is required. But if the limb be moved, or stimulated in any way, early, then necessity will arise for antiphlogistic measures — perhaps venesection, certainly copious and repeated abstraction of blood by leeches, accompanied with fomentations, and the internal exhibition of antimonials, purgatives, &c. When such is the case the cure is tedious, the joint long remains swelled and stiff, the patient is lame and incapable of exertion.

Leeching or puncturing at an early period, with the view of allowing extravasated blood to escape, is useless and hurtful. The effused and coagulated blood cannot be evacuated, and suppuration, followed by destruction of the cellular tissue, has often been the consequence of such ill-advised proceedings. Friction with stimulating liniments, or even simple friction, at an early period, is also hurtful, as tending to excite vascular action, and to convert simple swelling into inflammatory. The application of cold at any period is of little use, and ought certainly to be avoided immediately after the injury, as adding to the sufferings of the patient, and interfering with the natural processes which have commenced for the reparation of that injury.

In limbs that have remained stiff after severe and mismanaged sprain, the dashing of water, either cold or tepid, has been strongly recommended. The practice is not ineffectual; the vessels of the surface are excited, perhaps as by other friction, and perhaps by the reaction which follows the chill. But the limb is apt to become rheumatic; and, on this account, the state of matters will not be improved by this proceeding, unless it be resorted to with proper precautions.

In severe sprains there is reason to think that sometimes even the tendons yield a little — that many of the fibres give way, and that thus the tendon is thinned and elongated. Such injury happens often in horses, in what is called breaking down. In them the tendon is occasionally snapped entirely through, and the ends widely separated. The same occurs in the human subject. Separation of the muscular fibres, however, is rare; laceration of the tendon itself, or separation of the tendon from the muscle, is more common. The yielding of the broad tendons on the upper and fore, lateral and under parts of the abdomen, affords an example of laceration of tendinous fibre from violent exertion. The tendons of the limbs are more frequently injured, and in the lower oftener than in the upper. I have more than once seen the tendon of the biceps torn in violent exertion. In the thigh, too, some fibres occasionally give way from a similar cause. The supra-muscular fascia in the arm and thigh is apt to give way at one or more points during powerful exertion of the muscles, causing deformity by protrusion of muscle through the torn space. But it is in the apparatus for extending the foot, and raising the weight of the body, that laceration of tendon most frequently takes place. The accident is uncommon till after the middle period of life, when the body has become heavier, when muscular exertions have been less habitually practised, and when the fibre has grown more rigid. The person in raising himself over some slight obstruction in walking, perhaps attempting to pass a small ditch or stile, suddenly "breaks down." Or in dancing, — an amusement which he has long discontinued — a sudden snap is felt, with immediate lameness and slight pain in the back of the limb; swelling and discoloration follow; and these symptoms and signs vary in intensity according to the extent of the injury. Laceration may have been slight; the pain, swelling, and lameness are proportional, and at first an inconsiderable void can be felt at the upper part of the tendinous termination of the gastrocnemii. Sometimes no change is perceptible, and in such cases some have been of opinion that the slender tendon of the plantaris has given way and caused the lameness; but this is doubtful, and it seems more probable that stretching and yielding has taken place in some part of the tendon of the gastrocnemii, which had been in powerful action — probably, the tendinous and muscular tissues have been separated to a slight extent. Occasionally the tendo-Achillis is found completely torn through, and its upper end retracted; in such cases a large space is occasioned at the injured part, when the knee is extended and the foot bent. Sometimes the tendo-Achillis is cut through; I have seen both completely divided in the same individual — he recieved a wound by a cutlass across the back of both limbs, while endeavouring to escape from the mate of a vessel, in which he had been stealing. In rupture without breach of surface, the torn bloodvessels pour out their contents into the cellular tissue to a considerable extent, and if a proper mode of cure be not adopted immediately, inflammation quickly supervenes; and this is apt to terminate very unfavourably in the infiltrated tissue.

The tendon is united by the deposition of new matter, and the conversion of this into substance resembling the original structure from the vessels of which the deposit has taken place. The quantity of new formation necessarily depends on the extent of laceration and the space thereby occasioned. That such reparation of tendon does take place, and that to a very great extent occasionally, is placed beyond all doubt by the results of veterinary practice. "Knuckling over" in horses is occasioned by contraction of the flexor tendon; the heel does not reach the ground, and in order to effect this the tendon has been in many instances completely divided. The cut ends immediately separate, to the extent of some inches, and after a time this large space is filled up by a substance similar to tendon; so similar, indeed, that on post mortem examination, some years afterwards, a careless observer could scarcely distinguish any difference in the appearance of the various portions of the tendon. The same is observed after the operations for deformity of the foot in the human subject.

The treatment of lacerated tendon consists in placing the parts so as to relax the muscles whose tendons have suffered. In rupture of the tendo-Achillis, the knee should be bent and the foot extended, relaxing the muscle and approximating the separated ends. This is readily and conveniently affected by placing a slipper on the foot, and attaching to its heel a firm band, which is then fastened to a ring or strap placed on the thigh. This apparatus must be worn for six or eight weeks. Afterwards a high-heeled shoe should be used for some time; or if the union be still weak and imperfect, a splint may be placed on the fore part, resting on the dorsum of the foot and the fore part of the leg.

Bruise. — The effects of bruises or contusions are, separation of the cellular connexions, rupture of bloodvessels, and effusion of their contents into the cells; a cavity, often large, is thus formed partly by the direct injury, and partly by the subsequent effusion, and this is quickly filled with blood, partly fluid and partly coagulated. Immediate tumour forms; and the integument is discoloured, often beyond the principal swelling. The injury may, or may not, be attended with division of the integuments, or with fracture or displacement of the bones; but all injuries of the hard parts are attended with more or less bruising of the soft. Bruise is most frequently produced by a blow, and is most severe when the violence is resisted by an unyielding part, as by bone; a squeeze between two bodies, particularly if they be in motion, also inflicts extensive contusion. The swelling continues to increase for some time, and then gradually disappears along with the pain. As the tumour subsides, the discoloration increases; the thinner parts of the effusion have been absorbed, and the clot then shines through the skin, imparting to it various hues.

Bruise may be followed by inflammatory action. Then effusion is increased, bloody fluid is poured both into the cavity and into the unbroken cellular tissue, the whole parts become extremely tender, the surface inflames, and the excited action is apt to terminate unfavourably in the various tissues. Not unfrequently sloughing takes place, both of the skin and of the cellular tissue and fatty matter, with unhealthy suppuration and infiltration; and constitutional disturbance accompanies. All this is likely, nay, certain, to follow admission of air into the cavity filled with effused blood, whether by accidental wound or by intentional division of the integument. Meddlesome surgery is unfortunate here, as well as in many other cases. After scarifications, punctures, leechings, or incisions, the blood often seems to undergo a putrefactive process, and unhealthy suppuration is quickly established.

Sometimes the clot is not entirely absorbed, and considerable swelling remains for a long time, perhaps with slight tenderness of the part; a foundation is thus laid for abscess, either chronic or acute. Frequently the inflammatory action following on bruise is not so violent and rapid as that above described, but is limited in its consequences chiefly to the effusion of coagulable lymph. This may not be altogether absorbed along with the other effusion, it may become organised, and be the nucleus or germ of a new growth, of a tumour contrary to nature — deposit increases in and around the nucleus, and this formation, though at first of a simple nature, may become rapid in its growth, and may assume a troublesome or even a malignant action; and sometimes all this may occur at an early period, before the attention either of the patient or of the practitioner has been drawn to the action or to its effects. Many tumours can be traced to the effects of a bruise.

In the treatment of bruise, the parts should be placed in a state of absolute rest, and methodically fomented. Local bleeding is seldom required, and is of little use; at first it is hurtful. When, from the extent or number of the bruises, fever follows, general antiphlogistic measures must be resorted to. Cold and astringent applications, and other repercussives, as also stimulants, are pernicious in the first stage, and are not very useful at any time. Opening of the cavity must be carefully avoided, excepting when absorption has ceased, when the tumour has increased and become painful, and when the effused blood is putrescent, and unhealthy suppuration has commenced. Then the cavity should be opened freely, and by poulticing the clots and sloughs are got quit of; afterwards the parts must be supported, as also the strength of the patient. When from long want of use, in tedious cases, the parts have become cold, shrunk, and weak, as also happens in sprain, friction, champooing, tepid affusion, passive motion, and voluntary motion short of giving pain, will all be of use as tending to restore the circulation, the nervous energy, and the muscular development. If œdema remain, bandaging or a laced support will be required.

Amputation.— Every endeavour, which skill and experience can suggest, must be made before mutilation of the body, by the removal of even the smallest portion of one of its members, is resorted to. But there are cases in which mutilation, though a harsh remedy, is still indispensable for the saving of life. There are others in which it is prudent and proper to resort to operation, in consequence of a member becoming perfectly unserviceable, and likely to impair the usefulness of the individual. Such are very bad and complicated fractures and luxations — laceration of the soft parts of a limb to such an extent as to impress the experienced surgeon with a certainty that in a short time gangrene must ensue, and render the success of any attempt to save life very problematical. When the extent of injury is such that, though gangrene may not be dreaded, yet it is plain that extensive suppurations and exfoliations must necessarily take place, a question may arise as to whether immediate amputation is to be performed or not. This will be decided by the circumstances in which the patient is placed, and often also by his own feelings upon the subject. He may choose to run some risk, and endure much suffering, with even a very slight chance of ultimately preserving his limb. In cases of traumatic gangrene of the chronic form, amputation is not only justifiable, but imperative; as also in those cases of severe fracture in which the patient is sinking under profuse discharge, with disunited bones. And the same absolute necessity for operation exists in many diseased joints, and in some diseased bones, when the patient's safety would otherwise be endangered, or when, on mature consideration, it is evident that the member, if retained, must for ever be an encumbrance, and worse than useless. Certain tumours of bones, tumours involving joints, tumours and ulcers of the soft parts of a malignant nature, and without appreciable disease of the lymphatic system, will also demand recourse to the amputating knife. Patients, too, will be met with, who, after undergoing all the suffering attendant on disease of long duration — as exfoliation of bone and sloughing of tendons, following deep suppuration — will, to get rid of the annoyance of the stiff and deformed member, or part of a member, not only submit to, but urge and insist on, the removal of the offending part. Amputation will also occasionally be required for badly-formed stumps, as those in which the end of the bone protrudes through ulcer of the integument, and is necrosed — or those in which the bone has been sawn of an inconvenient length.

Many precautions are to be observed in this operation. It is not to be commenced without due consideration as to the position of the operator, and of his assistants — their several duties — the form of incision — the length of the stump — the difficulties, if any, which may be expected, and the best means of obviating them. The most prominent objects are, to save undue effusion of blood, to effect the incisions with as little suffering to the patient as possible, and to make them of such a form as to cover the end of the bone effectually —

so that pressure may, after a time, be borne without risk of ulceration of the soft parts, or exfoliation of the bone.

In all cases, and in all situations and circumstances, hemorrhage can be restrained during completion of the incisions, and during the employment of means to close the cut ends of the vessels, by means of very slight but exact pressure on the trunk of the principal vessel. The point at which this is to be applied should be at as short a distance as possible above the place of incision, and at the same time above the origin of any branches which must be cut. Not the slightest pressure should be made until the instant when the incisions are about to be commenced, so that no venous congestion may take place in the limb. All the blood in the limb, below the incisions, must necessarily be lost. The veins are more easily compressed than the arteries, and pressure, made a short time before the operation, may arrest the return of the blood, whilst it may not completely stop its influx; thus engorgement of the lower part of the limb is produced, and the quantity of blood that must be lost is increased. For a similar reason, pressure, sufficiently firm to stop arterial hemorrhage, is to be continued till the principal branches are tied, and then entirely removed; for the continuance of even slight pressure will increase the flow from the surface of the stump — blood, flowing in, and being arrested in its venous return, trickles out through the open ends of the veins. If a circular band be used for the compression, such as the screw tourniquet, it should be put on quickly, and screwed up at once, and then the incisions should not be delayed one instant after; there should be no relaxation of the pressure at any part of the operation; and as soon as the principal vessels have been secured, the apparatus should be altogether removed — otherwise, as already stated, rapid oozing will continue from the face of the stump. It is my confirmed opinion, that much more blood is lost from the use of a tourniquet than without it. I would rather trust to a no very efficient assistant, than put on a tourniquet. It is evident that compression on the whole circumference of a limb must completely interrupt venous return, and cause the increase of hemorrhage already mentioned; whereas pressure on only two points of the same circumference, as is effected by the hand of an assistant, is not liable to this objection. Besides, the latter mode is more quickly applied, and more readily removed, causes infinitely less pain to the patient, and is equally effectual in arresting the flow in the main arterial trunk. Neither does it interfere with the due contraction and retraction of the divided tissues. The incisions should always be made rapidly; and after their completion, the surgeon, if distrustful of his assistant, or if his hand has become cramped and tired, may himself grasp the limb and compress the vessel, giving the forceps or ligatures to another.

The first step in the operation is to arrange the measures for temporary arrestment of the bleeding. The patient is placed in a favourable position, either sitting or lying, as may be most convenient for the particular amputation, and is firmly secured by one or more assistants; all the apparatus must be in good order and conveniently placed, and an assistant should be stationed to attend to them, and hand those required. The compressor and the operator are each at their post, and ready to act in concert. The incisions may be made either from without inwards, or from within outwards, after transfixion of the limb. The latter mode is to be preferred when practicable, as requiring less pressure; the parts are more stretched than in the former method, are therefore more easily and rapidly cut, and consequently less pain is inflicted. To the inexperienced transfixion may appear cruel, it may appal them, but in reality it is almost unattended with pain; it is rapidly executed, and renders the operator capable of completing his work with great quickness and little suffering, and at the same time with neatness and precision. The knife should be of a size and length proportioned to the incisions, straight-backed, and with a good point; of a form to pass through readily, yet strong, and not too broad. With one sweep of this, the incisions are made at once, through the muscles, through the cellular and fatty tissues, and through the integument — or *vice versâ*, if the mode from without inwards be preferred. By these parts being cut rapidly and at once, their connexions with each other are not separated, the cut surface is smooth, and the parts are in the most favourable state for becoming agglutinated and consolidated; the bone is more deeply covered, and the stump of a handsomer and more useful shape, than when the parts are cut successively and with detachment.

The operator places himself so that he may grasp the part to be removed, during the sawing of the bone, without change of position. The incisions are made with the left hand free; but as soon as the saw is in the right, the left should take firm hold of the limb below the wound. During the operation, the limb is supported by an assistant, either sitting or kneeling before the patient; but the regulating of the position of the limb, during sawing, is not to be intrusted to him alone. He may, from anxiety to facilitate the action of the saw, snap the bone and splinter it when it has been little more than half divided; or, from dread of this, he may lock the instrument, and so delay completion of the operation. The management of the lower part of the limb should always be by the person using the saw. This instrument should have its teeth well set, and be provided with a workmanlike handle. It is worked steadily and not hurriedly, with very slight pressure, and that pressure employed only when pushing forwards. Before its application, all the soft parts must necessarily be divided completely; and this is done by carrying the knife, after formation of the flaps, round the bone, with its edge rasping on it, and as high up as possible. The instrument is then placed accurately on the point thus exposed, close to the soft parts, and during the sawing the flaps are well retracted by the hands of an assistant. The saw may be worked either horizontally or vertically; the latter direction is to be preferred, for thus, when the section is nearly completed, the uncut part of bone is deep, and less likely to snap on the weight of the limb being allowed to operate, or when undue pressure is made downwards. If splintering of the bone have occurred, whether from neglect of the foregoing precautions, or by other accident, the sharp projecting parts should be taken away, and the cut surface made quite smooth by means of the bone pliers; and with this instrument also, the sharp edge of the bone may be rounded off, in cases where subsequent pressure might cause ulceration or sloughing of part of the integument of the stump.

The arteries are tied close to their connexions. Their cut ends are laid hold of with the dissecting forceps, or by those represented at page 170, and pulled out; a small firm thread, either of linen or silk, is then applied tightly, and one end immediately cut away close to the reef-knot. Separation of the ligatures generally takes place from the sixth to the tenth or twelfth day; they produce little discharge or irritation during their presence, and no source of irritation connected with them is left behind. But when both ends are cut away close to the knot, separation is often long of taking place, and though the parts may heal over them kindly enough, the stump never can be considered sound till all are discharged. Probably several of these knots remain deeply imbedded after cicatrisation of the integument, and when the patient considers himself cured, and is moving about the room or ward, actively and cheerfully, painful hardness forms deeply, part of the stump reddens and swells, matter forms, and at length the insignificant origin of the mischief is discharged; and this may occur more than once. Generally such suppurations are limited, and soon cease; but occasionally the abscess formed round the knot is extensive, deep and free incision is required, the filling up of the cavity is necessarily slow, the cure is long protracted, and both practitioner and patient are disappointed and annoyed. Besides, the suppurations thus occasioned, though slight in extent, may, when in the neighbourhood of a principal arterial branch, cause ulceration of the coats of the vessel, producing troublesome hemorrhage at a late period. All these untoward consequences of cutting off both ends I have experienced in a series of cases, and from the results of a faithful comparative trial of both methods, I am now fully determined always to leave one end of the ligature hanging from the lips of the wound.

No one now, it is presumed, dreams of the absorption of ligatures, whether composed of animal substance or not; therefore the catgut ligature, at one time much recommended, has no superiority over the linen or silk thread, — besides it is not so convenient of application.

Twisting or bruising the cut ends of arteries has been long known as effectual in arresting bleeding. Vessels of a large size can be so treated with sufficient facility, and they may not bleed after; but well-tied ones are much more secure. The smaller cannot be pulled out and twisted, ligatures must be used for them; and the application of one or two more ligatures, namely, to the large arteries as well as the small, will add to the patient's safety, and to the operator's comfort and peace of mind, and can have little effect in increasing irritation. I have made trial of the method of torsion after amputation, and for the above reasons, and because the manipulations are more tedious, I disapprove of the plan, and decidedly prefer the ligatures. I am not aware that the proposal of leaving the vessels both untwisted and without ligature has been tried in this country; one would think that it must always be troublesome, and not unfrequently hazardous.

In some cases, as when the incisions are made in the neighbourhood of diseased bone, the soft parts are so condensed that the vessels cannot be pulled out by means of the forceps; they are to be transfixed by a sharp hook or tenaculum, and a ligature is then applied round the parts which the instrument holds; or the vessels may be encircled by a thread passed round by means of a curved needle; in both methods more or less of the surrounding tissues must necessarily be included in the noose, though always as little as possible. Sometimes an artery of the bone, whether sound or inflamed, bleeds sharply; in such circumstances the application of ligature is impossible, and I have occasionally been obliged to insert a wooden peg into the opening; to this a chord is attached by which it can be removed after a few days.

When bleeding has been satisfactorily arrested, the surface of the wound is to be cleaned of coagula, either with the fingers or with a warm and soft sponge, the ligatures are brought to the margin at convenient points, and the edges of the integument are then put together by interrupted sutures — two, three, or more, according to the extent of the wound. They need not be numerous, for they are only temporary, effecting partial approximation, and showing the line in which the parts are to be brought together by the after dressing. The stump is then covered with lint soaked in cold water, and this application is renewed frequently so long as any trickling of blood continues. Farther dressing is delayed for six or eight hours, when the oozing has entirely ceased, and the visible cut surface become glazed. Under this management, there is less chance of bleeding breaking out afresh than when the limb is encompassed by bandages and pledgets of lint, perhaps compressed so as to interfere with the return of the blood, and heated by superfluous dressings. If bleeding to any extent should occur, as there is always a risk of, after the patient has become warm and comfortable in bed, and reaction has been established, there is but little pain or annoyance in reaching the bleeding point, and taking measures to stop the flow; the few stitches are soon clipped away, and then the surface of the wound is completely exposed, and ligatures can be applied to those vessels which require them. Then, after removing all coagula, sutures are placed in the same perforations, and the stump is in as favourable a state as previously. I now generally leave the wound quite open, until all risk of hemorrhage has ceased, and, if one or two stitches are required, these are put in at the time of applying the plaster.

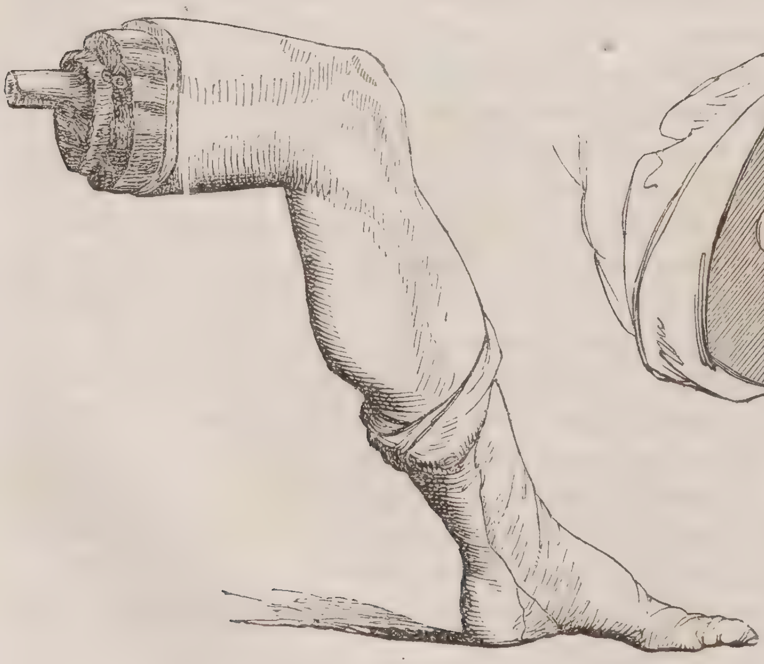
After six or eight hours, as already stated, any clots that have formed are to be taken away gently, and the glazed edges of the wound are then brought accurately and neatly together by the adhesive composition already recommended, — with the difference of its being spread upon slips of oiled silk, which I have found to be more pliable, and altogether preferable to the glazed riband. Interstices are left for the sutures and the ends of the ligatures, and the latter may now be abridged slightly. This mode of keeping the edges in contact I can confidently recommend from experience. The plasters are much more adhesive than those in common use, do not irritate, and are not loosened by discharge. After twelve or twenty-four hours, often much earlier, the sutures are clipped through and removed. No other dressing is required till the end of the cure, provided this proceed favourably. The part is kept cool, and the slight discharge which occurs in a day or two is wiped up from time to time, if it be in such abundance as to reach the oiled cloth over the pillow on which the stump is laid. No disturbance of the parts is necessary as when ointments, bandages, and compresses are employed, or straps that require frequent removal and reapplication. The patient suffers comparatively nothing; and the surgeon is saved much troublesome and dirty work, — for union by the first intention seldom fails.

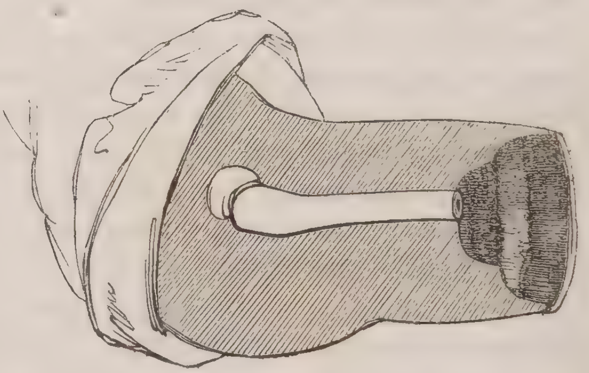
Bleeding within a few hours after the operation, before excited action of the vessels has commenced, is easily arrested by exposure of the surface, removal of all clots, for by these hemorrhage is encouraged, and by including the open vessels in ligatures. For the accomplishment of this, the period and mode of dressing, above recommended, afford great facility, as has been already observed. Hemorrhage at a later period is not common. It happens occasionally in consequence of the stump having acquired an unhealthy condition, from sloughing, — or from abscess, as when this occurs round ligatures which have been retained, along with the slough of the vessel and cellular tissue, both ends having been cut away. The matter formed during separation of the ligature in the usual way, escapes readily along the protruding end, but when there is merely a knot, the integuments have most probably closed over, there is no direct outlet; the matter is confined, and causes ulceration of the coats of the vessel as well as of the surrounding tissues. In this kind of hemorrhage, it is needless to attempt finding the bleeding point by tearing open the stump, separating any adhesions that may have formed, causing much pain and retardation of cure. And even though the bleeding vessel or vessels could be found, they are not in a state to hold a ligature. The artery is surrounded by sloughing cellular substance, its coats are tender, and in no condition to assume a healthy action necessary for permanent closure after deligation. If ligature is applied, the included part quickly separates, and then the vessel is as open as before. Astringents, and even the cautery, are useless. Ligature of the main arterial trunk, above the origin of branches supplying the stump, so as to weaken for a time the circulation, is found to be effectual. I have had recourse to this in many cases, and uniformly with success. Some years ago, several occurred in the Royal Infirmary, within a very short time of one another; it was during rather an unhealthy season, and at the time I was making trial of cutting off both ends of the ligatures. They were all after removal of the lower limb; one patient died — the amputation was high, through the trochanter minor, and the vessel tied secondarily was the common iliac; this had the effect of completely arresting the hemorrhage, but the previous loss of blood proved too much for the system to recover from; transfusion was had recourse to, and produced temporary benefit. The others, cases of amputation below the knee, made most favourable recoveries after ligature of the superficial femoral, and in more than one the stump healed very rapidly after its readjustment. Indeed, it is not unfrequently found that when the flaps are separated, from whatever cause, and replaced when the granulations have appeared, there follows a rapid union and cure.

When healing by the first intention has failed, fomentation and poultices are generally the most grateful and beneficial applications for a day or two. Afterwards, when suppuration has been fairly established, and the stump begins to be flabby and œdematous, simple dressing and uniform support by bandaging are required, sometimes along with compresses on particular points to prevent lodgement of matter.

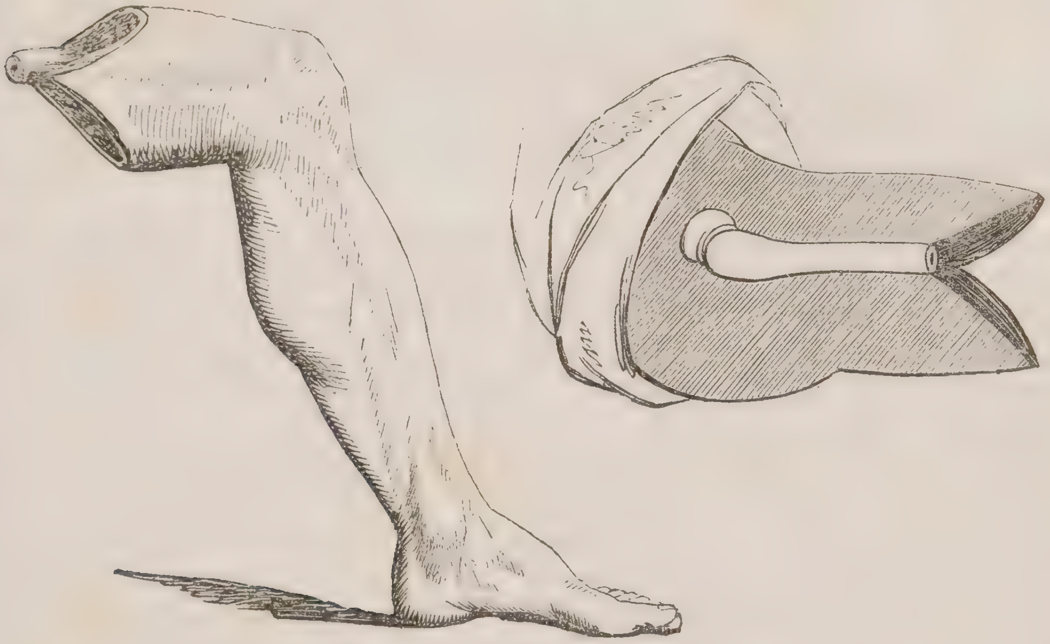
Sometimes the secondary hemorrhage is not an arterial and rapid flow, but a slow and continued oozing from a cavity, ulcerated, dark, and angry, round the end of the bone; this seems to arise from diseased action in the cancellated tissue of the bone. Removal of the coagula, stuffing the cavity with dry lint, and the application and continuance of firm pressure, generally suffice for its arrestment.

Hitherto, these general observations on amputation have regarded the operation by flaps only; the circular method has not been mentioned. The reason is, that the circular amputation has been, it is hoped, in a great measure abandoned in this country. And its inferiority to the method by flaps is so obvious, and so generally acknowledged, that detail of the different steps of the operation is, I conceive, here altogether unnecessary. It is more tedious in performance, more painful to the patient, does not afford so good a covering for the end of the bone, and consequently not so convenient and useful a support for an artificial limb, and the cure of the wound is protracted. The stump is almost always conical, the end of the bone is, ultimately at least, covered only by integument, and from even very slight pressure this is apt to ulcerate; exfoliation of the bone follows to a greater or less extent, or unhealthy ulcer of the soft parts continues, along with caries of the bone, and partial death of its surface; and at length it becomes necessary either to perfom a second amputation or to curtail the length of the bone. It may sometimes succeed tolerably well when there is but one bone: when there are two, it is altogether inadmissible. In very muscular limbs, when amputation is demanded on account of destruction of the bones and joints, with laceration of the soft parts, as when the patient is not required to have pressure made on the stump, it suits well to





make the flaps of integument only, and to cut the muscles short, as will be noticed more fully afterwards. The advocates for the circular amputation, my excellent friend Sir George Ballingall, and others wish it to be believed, (and this is their main argument,) that the exposed surface of the flaps is much greater than that in their favourite method. Some of the philosophers of the Modern Athens have been appealed to, and have measured, it is said, the area of the one and the other, and given their verdict in favour of the round about incision. The accompanying drawings from nature, and the corresponding diagrams, speak pretty plainly in favour of the other method. In the first there is a cone formed by the cut skin and muscles, with a corresponding hollow and ragged cavity; and the second set shows two smooth, nearly triangular surfaces, which the said philosophers may measure and report upon at their leisure.



Various accidents and diseases require removal, either primary or secondary, of the *fingers*, or of parts of them. Amputation is most easily accomplished at the articulations, and ought therefore always to be performed at these points, when the circumstances of the case permit. The last phalanx may require removal either on account of severe injury, or from incurable disease, as onychia maligna, necrosis, caries, &c. The operation is one by single flap, and may be conducted in one of two ways. The doomed phalanx is grasped, on its anterior and posterior aspects, by the fore and middle fingers of the left hand; and the articulation is flexed almost to the full extent, in order that incision into it may be facilitated. A straight, narrow, and sharp-pointed bistoury is carried in a semicircular sweep over the back part of the joint, so as to divide the integuments, and open completely the articulating cavity. The remaining ligamentous investments of the joint are divided by one or more additional touches of the knife, so as to loosen the base of the phalanx. The fingers of the left hand are then changed from the fore and back parts of the phalanx to its sides, the edge of the knife is passed behind the base of the bone, and the surgeon, by carrying the blade forwards and downwards, forms a flap of sufficient dimensions to cover the wound, and removes the offending part. There is seldom any trouble from hemorrhage ; no ligatures are required. The flap is turned up so as to form a cushion over the exposed surface of the middle phalanx, and is retained so by the adhesive composition formerly mentioned, or by one or two turns of a linen bandage. The other method of operation is the reverse of the preceding. The joint is extended, the bistoury is made to transfix close to the joint and at its anterior part, and by then carrying it downwards and forwards, as before, a similar flap is formed ; this is retracted by an assistant, and with one sweep of the knife the articulation is divided from before backwards. By either method the flap is the same. By similar procedure the amputation at the middle articulation is performed.

It is sometimes an object to save as much as possible of the proximal phalanx, when amputation is rendered necessary by disease of the middle articulation, or of the distal extremity of the bone. In such cases, two semicircular flaps are made by cutting from without, either on the lateral, or on the thenal and anconal aspect, and the bone is divided either by a small saw or by the cutting pliers. The flaps are retained in apposition, and the bleeding arrested by bandaging.

Amputation at the proximal articulation is also performed by double flap. In the previous operations an assistant steadies and supports the hand; in this he has likewise to bend the rest of the fingers, and to separate as widely as possible those neighbouring to the one about to be removed. The operator seats himself before the patient, grasps the finger so as to manage its movements with the left hand, and holding the knife perpendicularly, with its point upwards, lays it over the knuckle, and carries it obliquely upwards so as to open that side of the articulation. He then pushes the finger towards the opposite side, and with the point of the knife completes the loosening of the articulation; for this the blade of the instrument should never be employed, otherwise the integument will be cross-cut and mangled. After separation of the base of the phalanx by the point, the blade is passed behind, and carrying it downwards and outwards, a flap is formed similar to the first — both proportioned to the size of the wound which they are to cover, and the bone which they are to protect. The fingers may also be removed by the oval method, as described and delineated in the *Practical Surgery*. The flaps are retained in contact by bringing the neighbouring fingers towards each other. This also suffices, in general, to suppress the bleeding, but sometimes one or both digital arteries require ligature. At first, cold cloths are probably the best applications, with the view of stopping the oozing, and warding off inflammatory action. Vascular excitement is very apt to follow this amputation, when performed for disease of the finger, as after neglected or severe whitlow ; the soft parts in which the incisions are made are generally infiltrated and condensed, and prone to inflammation. The surface around is red, tense, and shining, on the second or third day; the back of the hand, the palm, and perhaps the forearm, are then involved in inflammation of the surface, and infiltration of the cellular tissue ; and in all probability, free incisions, followed by poultice and fomentation, will be necessary to restore the parts to quietude. Such consequences are to be guarded against as much as possible, by attention to the system, and by avoiding all irritating dressing.

The phalanges of the thumb are removed in the same manner as those of the fingers. Amputation of the metacarpal bone is accomplished thus. The thumb is grasped by the fingers of the left hand, and so managed. The bistoury, held in the same manner as for amputation at the proximal articulation of the finger, is placed with its point on the web betwixt the thumb and forefinger, and carried in one sweep rapidly upwards in a slightly oblique direction, till it is stopped by the os trapezium. The point is used to effect disarticulation, the member being at the same time pushed steadily outwards; the blade is then placed behind the base, carried downwards close to the side of the bone, and is not to be brought out till sufficiently low down for forming a flap to cover the whole wound. The flaps may be formed otherwise, and much more handsomely, by transfixion of the ball of the thumb, as shown in the *Practical Surgery*, p. 360. After arresting the hemorrhage, the flap is laid smoothly down, and retained in its proper position by bandage or slips of the adhesive plaster. The metacarpal bone of the little finger is removed by the same method of incision as for the thumb.

In amputation of the fingers, the incisions sometimes require to extend beyond the proximal articulation, on account of disease having involved that part; in other words, it may be necessary to remove more or less of the metacarpal bone along with the finger. The method of incision will vary according to the extent to which the bone is diseased. When the operation is required for disease of merely the distal extremity, the incisions are made in the same form as for amputation of the joint, only they are on each side sufficiently high to be beyond diseased bone. They may either be made from below upwards in the usual way, or be commenced at their highest point on the dorsum of the metacarpal bone. After the soft parts have been separated from the bone, by a few touches of the knife after formation of the principal incisions, removal is completed either by the cutting pliers or the metacarpal bow-saw — the former I have found the more convenient instrument. It is applied perpendicularly, and should always have its smooth surface in contact with the part to be retained, otherwise the cut part will be rough and irregular. Section is completed more rapidly than by the saw, and, by attention to the above precaution, the stump is equally smooth, if not more so. The wound is brought and retained in contact by approximation of the fingers. But in taking away any considerable portion of the metacarpal bone, it is of importance to preserve the palm uninjured. With this view, the knife is entered over the centre of the bone on its dorsal aspect, above the diseased part, and carried straight downwards till near the articulation, when it is made to diverge for the formation of lateral flaps; the integuments in the track of the longitudinal wound are then dissected backwards, so as to expose the bone completely, and the bistoury is passed round the bone throughout its whole extent, the edge being kept close to it, — in order that the soft parts may be separated, and that without unnecessary width of wound or implication of the palmar arches and branches proceeding from them. Then the bone is clipped at the proper point by the cutting pliers; or the section of the bone may be performed before separation of the soft parts from its under surface, as, by raising the cut end, this part of the operation may be facilitated. Here the metacarpal saw is inapplicable.

Before quitting this part of the amputations, it may be observed, that no good can result from taking away a metacarpal bone and leaving a finger, or from removing a proximal phalanx and leaving the distal. The parts so left can be of no use, they have no support, and the muscles cannot act upon them: they must prove an incumbrance, and as such will either form the subject of a second amputation, or remain a proof of the unsuccessful result of the first.

Amputation in the *forearm* may be necessary at various points, on account of accident or disease, but should never be resorted to, in either case, so long as part of the hand can be saved. The preservation of even a small portion of this useful member, even of one finger or a part of one, is of great importance to the patient. When, however, this is hopeless, all must be removed; and, if the wrist be sound, amputation may be performed at that joint. Hitherto, no mention has been made of the temporary suppression of bleeding, for in the amputations detailed there is scarcely ever any necessity for adopting such measures; but in those of the forearm and arm, a steady assistant must be placed ready to compress the humeral artery as soon as the incisions are commenced; in the case of the forearm, the pressure is made on the lower portion of the artery; in the arm, the point of pressure will necessarily depend on the point of removal. The patient may be either seated or recumbent. One assistant compresses, another steadies the limb in the supine position. The surgeon holds the hand in his left, standing on the inside of the right limb, and on the outside of the left. Suppose the right wrist is to be operated on, — the end of the ulna is felt for, and at that point the knife is entered, and drawn across the wrist on its dorsal aspect in a semilunar direction, the convexity of the curve of course pointing towards the fingers. The joint is opened by retracting and dissecting back the flap so formed; the knife is then passed behind the scaphoid and lunar bones, which are exposed and turned out by division of the ligaments, and by rapid and gentle sawing motion downwards and forwards, a flap of sufficient size is then formed on the palmar aspect. The dorsum of the hand may be so diseased or injured as not to afford sufficiency of sound parts for a posterior flap; in such circumstances the anterior must be made proportionally large, that it may alone cover the ends of the bones. After suppression of the bleeding, the flaps are approximated by one or two points of suture; these are afterwards removed, and their place supplied by the adhesive plaster.

Amputation, at any point between the wrist and elbow-joints, requires, in all, the same method of incision, but the nearer to the elbow the better is the stump; at the wrist the flaps are composed principally of integuments and tendons, and the cushion so formed for the bones is very inferior to one of muscle. Compression is made and the limb steadied as before; the surgeon with his left hand grasps the wrist, and places the forearm in the middle state between pronation and supination. In the right forearm, the knife, held perpendicularly, is entered over the centre of the radius, and its point, after reaching the bone, is inclined inwards so as to pass round it; transfixion is then made, the knife passing close to the palmar surface of the bones, and emerging at a point opposite to its entrance; and then by rapid motion downwards and inwards, a proper flap is formed. The instrument is again introduced over the radius, at a little distance from the upper part of the first wound, and passed on the opposite side of the bones, emerging also in the first incision and at a similar point; another flap is made. These are retracted, the knife is swept round the bones, and passed freely between them, to divide the remaining muscular substance, and after this has been completed, the saw is applied. During the sawing it is well to preserve the limb in the same position as during the incisions, and to apply the instrument perpendicularly; thus both bones will be divided at once, and the risk of splintering diminished. In transfixion, great care is required that the point of the knife pass across, not between, the bones, and with this view a slight change of position is useful; during the transfixion for the inner flap, the surgeon, as soon as he feels the knife rounding the radius, rotates the forearm gently inwards, and in transfixing for the outer flap similar rotation is made outwards. In this situation, and others where the soft parts are less thick in one aspect than the other, it is by much a preferable plan to make a flap first, by cutting from without inwards, as already described in regard to the wrist, and then to transfix for the formation of the second flap. This is delineated in the *Practical Surgery*, p. 367. Sometimes slight difficulty is experienced in tying the interosseal artery. The flaps are brought together, and treated in the way already mentioned.

In all amputations of the upper extremity, it is of importance, and indeed a rule scarcely to be departed from, to leave as much of the limb as possible; for here the longer the stump, the more useful is it to the patient. In accordance with this maxim, amputation at the elbow-joint may be required, when either disease or injury extends too high for amputation in the forearm, but not too high for the formation of an anterior flap over the joint. The limb is steadied in the supine position, compression being made near the middle of the humeral artery; the knife is passed horizontally across the condyles close to the bone, and brought downwards and forwards to a sufficient extent for the production of a flap, which is alone to form the protecting cushion. The joint is then cut through, the knife is passed down till obstructed by the olecranon, and with one sweep a semicircular incision of the posterior integument is made. All soft parts in this line are divided, and then the saw is applied to the olecranon process. This amputation is easy, rapid, and beautiful in execution; and, when the flap is sufficiently large, — as it always may be, for there is no want of soft parts in front, — the stump is well formed and useful. The flap is laid down, and attached by suture to the integument posteriorly; in due time the adhesive dressing is applied. The circumstance of a secreting surface forming the stump does not seem detrimental, either here, or in the wrist-joint. The synovial fluid soon ceases to distil, and union is not interrupted by it. There is no necessity for scarification, or scraping the cartilage, with the view of hastening cessation of secretion and granulation of the surface.

Amputation of the *arm* is performed by the formation of lateral flaps, at any point below the insertion of the deltoid muscle. Compression is made on the upper part of the humeral, or on the axillary artery. The limb is held well separated from the side; and care should be taken that, when so raised, its height be convenient to the operator. The knife is entered perpendicularly to the shaft of the bone, passed fairly down to it, and then inclined along its side; the operator now grasps the limb below the line of incision with the left hand, and pulls the muscles towards him — it is supposed that the right arm is being amputated, the surgeon standing on the inside, and an assistant supporting the forearm — and then completes transfixion, inclining the handle of the knife towards himself, in order that its point may pass round the bone and emerge at as distant a point in the circumference of the limb as possible. By a rapid sawing motion, downwards and inwards to the proper extent, the inner flap is formed; and by attention to the grasping of the muscles and the inclination of the knife, its base is so large as to admit of the more easy performance of accurate transfixion for the outer — that is, the instrument is more easily brought through the same incision. The assistant seizes the extremity of the inner flap as soon as formed, and retracts it, but only to a slight extent; it is simply held out of the way. If it be pulled backwards, as in retraction during sawing, the formation of the second will be much impeded. The knife is again entered about half an inch below the commencement of the first incision, and by inclining the handle the point is brought round the bone, and made to appear on the opposite side also in the first incision; this is facilitated by pulling the soft parts outwards with the left hand. Then the outer flap is completed. The knife is swept rapidly round the bone, so as to expose it completely at the upper part, the assistant at the same time retracting the flaps fully. The saw is applied, the arteries tied, the flaps approximated, and the operation completed.

In performing the second transfixion, the reason why the knife is entered lower than in the first, is, that cross-cutting of the corners of the wound is thereby avoided. For a long time I was surprised and annoyed to find many stumps present an unseemly cross-cutting of the integument at the upper parts, particularly after approximation of the flaps, although the incisions seemed to have been made smoothly and accurately. It is occasioned by the sawing process for making the second flap, and when this is commenced at the same height as for the first, irregularity of incision at the upper part is unavoidable. The precaution, however, of making the second transfixion considerably lower than the first I have found quite effectual. The disparity between the bases of the flaps is readily and quickly remedied, after their formation, by a sweep of the knife upwards on the lower side.

Irritable and painful stumps are more frequently met with after the amputations of the arm and forearm than any other. The occurrence, however, is less common than formerly, and this may be fairly attributed to the improvements in the operation — to the method by flaps having superseded the circular, and nothing but the arteries being surrounded in ligature. Still the affection is occasionally met with, and there can be none more painful and troublesome. Generally, no obvious cause can be found for the attack of this malady; but in some of the cases there would seem to be a constitutional and innate tendency, as it were, towards this irritability of the cut and bulbous extremities of the nerves — as in the following case: — A gentleman, aged 53, underwent amputation of the thumb, in consequence of laceration of the hand. Amputation was very soon afterwards performed at the middle of the forearm, on account of hemorrhage and infiltration of the hand, after fruitless attempts to secure the arteries. After cicatrisation of the wound, he complained of great pain in the stump, and in the situation where the tourniquet had been applied. Amputation of the arm was then performed, but the stump was not well made. The pain returned, and he applied to me, with the view of again submitting to amputation. It was performed nearer to the shoulder-joint, and in order to guard against recurrence of the disease, the nerves were laid hold of, pulled outwards, and cut across as high as possible. The patient was relieved of many of his sufferings, and continued tolerably comfortable for nearly two years; again, however, the painful symptoms have returned, though in a slighter degree. On examining the removed stump, all the nerves, particularly the musculo-spiral, were found greatly enlarged in their extremities, and intimately adherent to the cicatrix and the ligamentous covering of the rounded extremity of the humerus. More desperate operations have even been performed to free patients from irritable stump. The lower limb has been hacked off bit by bit, even to the coxo-femoral articulation, without much, if any, relief. Such operations are hardly warrantable.

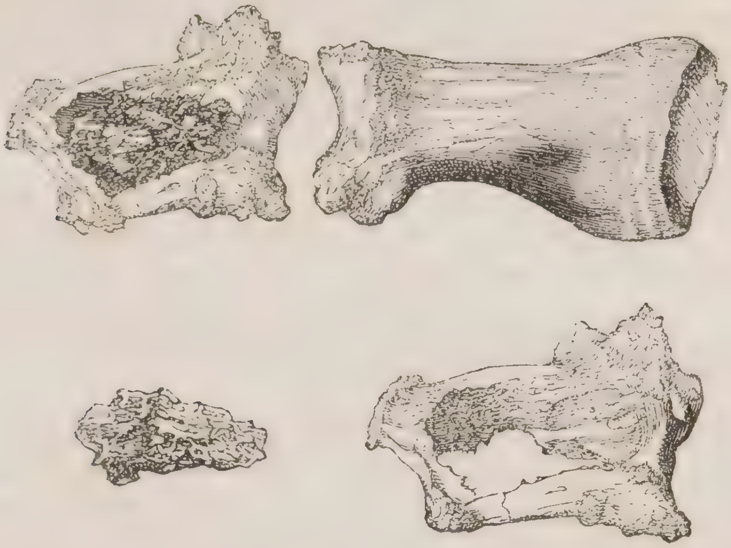
Amputation at the *shoulder-joint* is more frequently required for accident than for disease. It has always been the custom to trust for suppression of bleeding, during this operation, to the hands of an assistant; and when the method has been found effectual in the case of the large axillary artery, why should it be objected to, on the score of inefficiency, in the minor amputations? particularly when it is evident, putting efficiency out of the question, that it is preferable to compression by the tourniquet, or any other circular apparatus; — more quickly applied and relaxed; less painful, less formidable; always ready, and independent of the instrument-maker. The compression is made above the clavicle, so as to secure the subclavian, where it passes over the first rib. The thumb of a steady assistant is placed deeply into the cavity of the lower triangular space of the neck, immediately above the first large sinuosity of the clavicle. The pressure thus made is quite effectual; but as it requires to be firm and uniform, and as there is always a risk of the thumb giving way from exhaustion, it is better to interpose some mechanical contrivance when the assistant is either diffident or inexperienced. The best apparatus for this purpose is a common door-key. A bit of lint or cloth is wrapped round the handle, and this part is then pressed down on the vessel. As in other amputations, the pressure is not commenced till the knife is about to enter.

The flaps may be double, on the outer and inner aspects, or one may be made sufficiently large to cover the whole wound. The patient is seated on a chair, and secured by a person placed behind. The arm is raised a little from the side, and supported by an assistant. Two oblique incisions are made, commencing high on each side of the shoulder, and converging gradually till they meet near the insertion of the deltoid. The triangular flap, so marked out, is dissected rapidly upwards, close to the bone, and kept raised by an assistant. The person supporting the arm then uses it as a lever, carrying it downwards and backwards; the joint, thus made more palpable, is cut into by a semicircular sweep of the knife across it; the head of the bone is now dislocated, and the rest of the capsule and fibrous tissue exterior to it divided; the blade of the knife is insinuated behind the head of the bone, and carried rapidly through the remaining soft parts. In no amputation can I conceive any necessity for suspending the incisions, in order to secure vessels, provided the pressure is well applied, and the knife used dexterously. Here very little blood should be lost. The vessels divided in the formation of the flap are small, and the axillary is not cut till the incisions are nearly completed; as soon as the limb has dropped, the surgeon places his finger on the mouth of the artery, and then applies his ligature as quickly as possible; the pressure may now be removed, and the minor vessels secured leisurely. The flap covers the wound completely, and is easily retained.

Or two flaps may be made by transfixion. In operating thus on the right limb, the surgeon, standing in front of the patient, enters the knife a little below the point of the acromion, passes it across the outer aspect of the joint, and by inclination of the handle outwards, makes its point to appear on the inside of the outer margin of the axilla; by carrying it downwards and outwards to a sufficient extent, the outer flap is formed. This is immediately elevated by an assistant, and then the arm is pushed upwards, and across the chest, so as to render the joint more accessible; the ligaments are cut, the bone disarticulated, the knife passed beyond its head, and placed with the edge parallel to the shaft of the humerus, and the arm restored to its former position; the inner flap is then made by carrying the instrument downwards and inwards. In the left limb, the knife is entered on the inside of the outer border of the axilla, and brought out below and in front of the extremity of the acromion, reversing the order of the former incisions; after the outer flap has been so formed, the joint is cut across, the knife passed beyond the head of the bone, and the inner flap made as before.

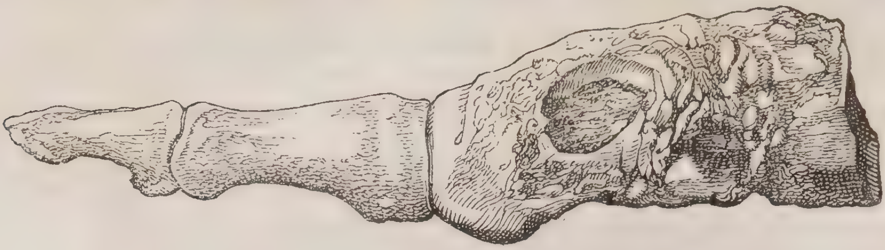
Accidental injury, as already stated, is the most frequent cause for amputation at this part, and this will always influence the method of incision. There is nothing peculiar in the after-treatment of the stump. But it ought always to be remembered, that the operation is one of great severity; that a large part of the body has been suddenly removed; that, consequently, there is risk of the mere shock being dangerous, and of an untoward constitutional condition supervening—and, therefore, the after-attendance should be zealous and careful.

The phalanges of the *toes* are removed in the same way as those of the fingers. This latter operation may be required on account of bad onychia, large exostosis or injury. This and the other must also be removed on account of diseased bone, such as here represented with affection of the interposed joint. The osseous shell formed by the enlargement of the original tissue encasing a segmentum is well represented. In the amputation at the proximal joint, it is to be recollected that the extremity of the metatarsal bone lies more removed from the web of integument betwixt the toes than the metacarpal bone does from that of the fingers. The incision upwards, therefore, requires to be deeper; but in other respects the operations are precisely the same.



In amputating at the proximal articulation of the great toe, there is often a difficulty in obtaining a sufficient covering for the wound, on account of the presence of the sesamoid bones, and the general bulging of the heads of the bones. The knife is entered on the dorsum of the metatarsal bone, about half an inch above the joint, and then inclined to each side, marking out lateral flaps of considerable length; these are then reflected, — in making the outer, the instrument being dextrously passed round the sesamoid bone, — and the disarticulation completed.

In removing the great toe, along with the metatarsal bone, the bistoury is entered over the articulation of the metatarsal bone with the tarsus, and carried straight downwards, along the centre of the dorsum of the bone, till near its extremity; it is then inclined to each side, in the manner described for amputation of the metacarpal bones. The integuments are dissected off on each side of the longitudinal incision, and the knife run up along the inside of the bone, till stopped by the tarsus. The surgeon now presses the toe outwards, so as to assist the disarticulation; and after this has been completed, the bistoury is carried downwards, close to the outside of the bone, and not brought out till past the lower articulation. The external flap thus formed is then laid accurately down, so as to cover the wound, and retained. The preferable mode of making the flap, so as to expose the metatarsal bone for division or disarticulation, is well illustrated in the *Practical Surgery*, p. 375. The entire bone must be removed in such cases as that here sketched. In cases in which the shaft is comparatively sound, and the disease is principally seated in the articulation with its distant extremity, the shaft may be divided with the cutting forceps at a point sufficiently removed from the disease. The operations on the other metatarsal bones are the same as those on the metacarpal. They may be removed, either entirely or in part, along with the corresponding phalanges, by operative procedure similar to that practised on the hand.



Sometimes disease of the *foot* is not so extensive as to require or justify removal of the whole organ; the metatarsal bones are not involved throughout their whole extent. The same remark applies to injury by accident. In such circumstances, amputation is performed at the articulation of the metatarsal bones with the tarsus. The operator first ascertains the exact site of these joints, and then transfixes the foot at that point, passing the knife close along the plantar aspect of the bones; carrying the instrument downwards, a sufficient flap is formed to cover the stump, or a semicircular flap may be made and reflected by cutting from without inwards. The integuments on the dorsum are then divided in the line of articulation, the joints divided successively, and the parts removed. The flap is raised, adjusted, and retained. In dividing the articulations, it is to be recollected, that the base of the second metatarsal bone, reckoning from that of the great toe, is lodged considerably higher than the others; and, therefore, the knife must be inclined upwards at that point, or else the use of the saw is requisite. The stump thus formed proves exceedingly useful: the subsequent lameness is not great; the heel and tarsus compose a very efficient support for the weight of the body, and the flexion is unimpaired; by attention, too, the deformity may be in a great measure concealed. In short, the surgeon who amputates above the ankle, for disease or injury not extending to the articulation of the metatarsus with the tarsus, is guilty of a serious error.

The disease may reach higher than is compatible with the preceding operation, and yet it may be possible to save the heel. In such cases amputation is performed in the articulations of the os calcis with the os cuboides, and of the astragalus with the os naviculare. The plan of the incisions is the same as that for the operation at the bases of the metatarsal bones.

No amputation is more frequently performed than that of the *leg*. Operation near the ankle is inadmissible; sufficiency of soft parts, for the protection of the stump, cannot be procured lower than the calf. Incision is completely limited to two points, either immediately below the tuberosity of the tibia, or in the bellies of the gastrocnemii. The former is the situation to be preferred in hospital practice, and amongst the lower orders generally; the latter is suitable to the better classes of society, that is, to those who can afford to purchase an expensive artificial support. The amputation below the tibial tuberosity being the most frequently required, will, with propriety, be described first. Suppose the right leg is to suffer: — The operator places himself on its inner side, according to the general rule formerly inculcated, and grasps the lower part of the limb with his left hand, an assistant supporting the foot at a proper height, and controlling motion. The knife is entered over the fibula, on its outer aspect, and carried upwards along that bone for an inch and a half, or two inches; it is then brought across the limb in a semilunar direction, the convexity of this incision pointing towards the foot, and after reaching the inner and lower part of the tibia transfixion is performed, the instrument being pushed along the posterior surface of the bones, and made to emerge at the upper part of the fibular incision. By then carrying the knife downwards, a posterior and larger flap is formed sufficient to cover the stump. All this is effected by uninterrupted sweeps of the knife, that is, without ever removing the point or edge from the track of incision. The integuments on the fore part are then dissected upwards a little, by a few touches of the knife, so as to form a small semilunar flap; at this part of the operation there is no necessity for laying down the knife and using a bistoury. The muscles in the interosseous space are then completely divided, and the knife swept round the bones to detach the soft parts still uncut. The saw is applied, either in a horizontal or perpendicular direction; I prefer the latter for reasons already assigned. The vessels are secured, and there are generally but three — the popliteal, and two sural. I now generally aim at cutting the vessel before it divides, and seldom fail in doing so. There is then possibly the popliteal only requiring ligature, and there is less chance of secondary hemorrhage. This has occurred, so as to prove fatal at a considerable period after the operation, in consequence of the posterior tibia being cut close to its origin, and no clot having formed in it. Before adjusting the flap, it is well to assist nature in rounding off the end of the tibia, and thereby prevent danger to the integument; with this view the sharp anterior ridge of the bone is cut away and rounded off by means of the pliers. This must be done sparingly if at all, and with great caution. The nipped surface is liable to exfoliation, or the medullary web is apt to be injured, and this is inevitably followed by more or less death of bone. To some the fibular incision may appear unnecessary; but I have long practised it from conviction of its advantage. It is an excellent mark for transfixion, and assists greatly in preventing entanglement of the knife betwixt the two bones; besides the soft parts in this situation must be divided at one or other step of the operation, and hence the procedure cannot be objected to on the ground of causing unnecessary wound. In operating on the left limb, there is not the same danger in transfixion, and consequently so long a preliminary incision on the inside is not requisite; in other respects the steps of the operation are the same as for removal of the right. In muscular subjects two semilunar flaps had better be made, one from the anterior aspect of the limb, the other from the posterior, the muscles being cut short in the ham, and the incision made to reach the popliteal artery.

It has been proposed to excise the head of the fibula after formation of the flap, instead of sawing it across at a corresponding point with the tibia. At one time I put this modification into extensive practice, with the effect of improving the appearance of the stump very considerably; but in several cases, untoward consequences took place. Discharge of synovia occurred on the second day, followed by very profuse suppuration, which proved of long continuance, and very exhausting; in more than one case, the joint became anchylosed, rendering the stump very inefficient as a means of support, in consequence of being fixed at an inconvenient angle; and one patient sank, exhausted by the profusion of the discharge. I then found, from repeated examination of the parts on the dead subject, that it was very difficult, nay impossible, to excise the head of the bone without dividing the capsular ligament, and wounding the synovial pouch, or opening a bursal cavity, beneath the popliteus muscle, communicating with that of the knee-joint. It is scarcely necessary to add, I have since wholly abandoned this method of operation.

It has been already observed that high amputation of the leg is preferable amongst the working classes. The limb is of much greater use to the patient than were the stump longer; he is able to follow his occupation with greater ease and security, and at less expense, by resting on the knee, than by using the artificial limb applied to the middle of the leg. The wealthier patient, however, can afford a more expensive support, and a less efficient, though more handsome continuation of the limb suffices. In such circumstances, amputation is performed at the middle of the leg; after cicatrisation, the artist supplies an artificial support resembling the natural limb; and thus the motion of the knee is preserved. The same directions apply to this operation as to that immediately below the knee.

In amputation of the thigh, the same method of incision is followed as in amputation of the arm. But, according to the point of removal, the direction of the flaps varies. If in operating high in the limb the flaps be made laterally, there will be imminent risk of the bone protruding through the upper part of the wound; for the patient uniformly raises the stump towards his abdomen. No antagonist muscular power is left to oppose the action of the muscles inserted into the trochanter minor, and the elevation of the stump is involuntary: it always occurs to a remarkable extent in young persons. On this account, anterior and posterior flaps are here far preferable to the lateral; for then the more the stump is raised, the better is the end of the bone covered — the anterior flap folds over it. Transfixion is therefore made horizontally; and the posterior flap should be a little longer than the anterior. But in the lower part of the limb, lateral flaps are not only not liable to the same objection, but preferable to the anterior and posterior. In the neighbourhood of the knee-joint, the soft parts consist almost entirely of ligamentous tissue on the fore and back part, and proper cushions can be obtained only from the sides. Transfixion is therefore made perpendicularly. Thus the bone will be well covered by parts likely soon to adhere; and there is no risk of protrusion, for muscles are left to counteract the elevators, and there is sufficient lever in the limb whereby to control its motions. And it may be here mentioned, that after all amputations, when startings of the muscles are not only painful, but disturb the position of the stump, the limb should be bound down by a broad band, passed across it a short way above the wound, and fastened firmly at each end to the bed or pillow; at the same time anodynes are to be administered. I have long since come to the conclusion that the femur in amputation should not be sawn lower than its middle; the method by anterior and posterior flap is therefore the only one applicable.

Amputation at the *hip-joint* is deservedly ranked amongst the most formidable operations in surgery. It ought, therefore, never to be performed but as a last and necessitous resource for the salvation of life. At the same time, when necessity for it is obvious and acknowledged, and no other means can be of any avail, hesitation and delay should never take place; otherwise the last and only chance of saving the patient will pass away, and the operation, when at length performed, will but hasten his exit from this world, — and besides inflict an injury to science, by intimidating practitioners, and affording subject of reproach and ridicule to the thoughtless and uninformed part of the public. I prefer the formation of anterior and posterior flaps, — as follows: — The patient is placed recumbent on a firm table, his nates resting on, or rather projecting a little over, the front edge. The sound limb is separated from the one to be removed, and held aside by an assistant. Or it is secured to the foot of the table by a towel, the necessity for an additional assistant being thus done away with, and more freedom in his movements afforded to the operator. Indeed, in all amputations of the lower extremity, this is the preferable method of fixing the sound limb. The other limb is supported by an experienced and intelligent assistant, who understands, and is able to perform, the movements to facilitate the different steps of the operation. The compression is intrusted also to an experienced and steady assistant, who, standing by the patient's side, presses firmly with one or both thumbs on the femoral artery, where it passes over the pubes; and in this more than in any other operation should the pressure be delayed till the instant of incision, for otherwise the blood lost in the limb will be immense. Transfixion, by a knife proportioned in size to the dimensions of the limb, is made horizontally, the instrument being passed in a somewhat semicircular direction, so as to include as much of the soft parts as possible; an anterior flap is made by cutting downwards. During the passage of the knife across the joint, the assistant rotates the limb a little, so as to facilitate the bringing of the instrument out with its point well inwards; in the left limb the rotation will be inwards, in the right outwards. After formation of the flap, the assistant abducts forcibly, and presses downwards; the joint is opened, the round ligament cut, the capsule divided, and the blade of the knife placed behind the head of the bone and the large trochanter ; the posterior flap is then made rapidly. After transfixion for the superior flap, and when the sawing motion downwards has advanced but a little way, the compressing assistant shifts one of his hands into the incision, immediately behind the back of the knife, and so obtains a firm grasp of the femoral artery previously to its division. He retains this hold, at the same time retracting the flap, during the rest of the operation. As soon as the limb has been separated, the surgeon secures the vessels on the posterior flap, partly by his fingers, partly by compression with a large sponge, and ligatures are applied as quickly as possible. The femoral is secured last ; for, as long as the assistant retains his hold, hemorrhage from it is not to be dreaded. Thus, when both surgeon and assistants are quick and cool, the operation may be completed with the loss of much less blood than might be expected. I have had occasion more than once to perform this operation, and thus speak from experience. In cases of accidental injury requiring this operation, the lever use of the limb must frequently be wanting; and in such cases, too, the parts may be so injured as not to afford flaps anteriorly and posteriorly. In these circumstances, the surgeon must be guided by experience and judgment in adopting the mode of procedure which appears most applicable ; in ordinary cases the operation above detailed appears the preferable.

Excision of diseased portions of bones, is practised occasionally with the view of removing a source of irritation and exhaustion from the system, without sacrifice of a limb. When the operation proves successful, the beneficial effect on the general health is as remarkable and rapid as after removal of the hectic cause by amputation ; the pulse falls and grows firmer, diarrhœa and sweating cease, the hectic flush leave the cheek ; in short, the constitution makes a complete and successful rally. It is had recourse to in order to take away disease in the following situations,— in the cancellated articulating extremity of a long bone, in part or the whole of a short bone, and in part or the whole of long bones. Even a long bone, from one articulating surface to the other, may be removed ; the metacarpal bone of the thumb, and the metatarsal bone supporting the great toe, may, for example, be taken away in their whole extent. I have seen these bones so treated, but the result was unsatisfactory. As has already been observed, the part of the member that is left is without support, and not under the influence of muscle ; it is consequently loose and useless.

Operation for the removal of necrosed, or softened and ulcerated portions of the carpal and tarsal bones, is sometimes successful. But operative interference, either with these, or with more extensive and formidable articulations, is not advisable unless the soft parts are not largely involved, and when the general health is tolerably good — the patient either having suffered less than usual, or having rallied and begun to gain strength after exhaustion by discharge and fever. If the ligaments, bursæ, and cellular tissue are much affected, as is often the case, there is no chance of discharge ceasing, and the patient regaining health, even though the bone be removed to any extent—a second operation will be required, namely, amputation above the diseased parts. And when this becomes requisite, after failure of the first to restore or even improve the health, the patient is apt, as has too often been the case, to sink under the accumulation of suffering. He might, even though much exhausted, have been able to bear up against the shock of one and a successful operation, but he cannot endure that of a second, or perhaps third, serious and protracted attack of the knivesman. The disappointed hope of a cure from the first operation is a secondary, though nevertheless a sure contributor towards the unfortunate issue.

No particular rules can be laid down for the operative procedure. By converting two or more natural openings into one, extending the incisions as much as possible in the direction of the limb and of the muscles and tendons, and avoiding the course of the larger blood-vessels and nerves, room is made for an accurate examination of the diseased parts. A strong and firmly pointed knife is required for these incisions, for the soft parts are much consolidated, and are cut with difficulty. The extent of disease is ascertained both by the probe and by the finger, and farther measures, if necessary, are then adopted for complete removal. Loose portions of bone are taken away; and often large sequestra of the cancellated tissue are found lying in the cavity, either loose or easily separable; for extraction, forceps and the fingers, and sometimes a lever, are required. A firm scoop is useful for removing such portions of diseased cancellated tissue as are still continuous with the shaft of the bone. When an opening in the cancellated tissue, leading to an internal sequestrum, is minute, enlargement is effected by means of either the trephine or the cutting pliers: afterwards, gouges, gravers, &c., may sometimes be useful in operating on the soft texture underneath,—but they are seldom requisite. The bleeding from the soft parts is free; the vessels do not retract, and may require the application of a needle and ligature. That from the bone is easily arrested by pressure: the cavity is filled with charpie or with dossils of lint, and these are supported by a bandage. Some days after, this dressing is removed, having been previously softened and loosened by fomentation and poultice. The cavity should now be examined carefully, to ascertain whether or not all the diseased parts have been taken away; it is then dressed daily from the bottom. If parts of the surface assume an unhealthy aspect, the granulations being either backward or flabby, to these escharotics should be applied—the most suitable is the red oxide of mercury. Gradually the cavity fills up, and a depressed, firm, and permanent cicatrix is obtained. It need not excite surprise, however, if, in not a few cases, after matters have proceeded apparently very favourably for some time, the surface become pale, soft, and glistening; the discharge thin, acrid, and profuse; the integuments around tumid and discoloured,—if, in short, the disease be in no long time fully reëstablished.

The tarsal and carpal bones are often the subjects of this operation. In a few cases I have removed several, in others one or a portion of one, with success. In one instance the greater part of the astragalus was taken away, along with the ends of the tibia and fibula. There remained, in consequence, a large opening across the joint, through which a cord was passed, to facilitate gradual and piecemeal discharge of remaining portions of diseased bone. The articulation could actually be seen through. The seton was gradually diminished and the aperture closed. The foot was thus preserved, and the leg was but little shortened; the limb proved strong and extremely useful, but the ankle-joint retained little or no power of motion. I have also again and again trephined the os calcis, and removed large portions of it; the cuboid likewise has been taken away, along with the base of the metatarsal bone or bones in connection with it; in some of these cases an excellent cure followed, in others amputation of the foot was afterwards necessary.

Some have ventured to cut away the articulating ends of the bones composing the *knee-joint*. This may be accomplished without much difficulty. The patella is either removed entirely or turned to a side, the ligamentous and tendinous attachments are divided, and the ends of the bones thus exposed; by cutting close to and towards them, little risk is incurred of wounding the bloodvessels and nerves in the popliteal space. The saw is readily applied in a horizontal direction. After tying the vessels, and approximating the edges of the wound, the limb is placed in the straight position, and retained fixedly so by the application of splints. Much constitutional disturbance is to be expected, as well as profuse and tedious suppuration. There are few surgeons so rash as to have recourse to this operation. One or two patients, it is true, have lived in spite of it, retaining the limb in a tolerably useful state. But in others, — and these constitute the majority, — amputation was after all required, and that proved insufficient to save the patient. In short, the results of excision of the knee-joint do not justify its repetition.

The articulating ends of the bones composing the *shoulder-joint* have been removed; and this may be done with advantage on account either of disease or of injury. This joint is, like others, liable to ulceration of the cartilages, either primary, or in consequence of abscess and degeneration of the soft parts around. The disease is attended usually with painful feelings increased by motion, and the patient is indisposed to attempt motion. Sometimes merely weakness of the limb is complained of, and the attention is drawn to the wasted appearance of the muscles, particularly of the upper arm; the deltoid seems shrunk almost to nothing. The motions above the shoulder are lost; and abduction is impracticable. Much pain is produced by pushing sharply the articulating surfaces into contact, and is further increased by rotation. The enforcement of strict and absolute rest of the joint, the establishment of a drain in the soft parts immediately neighbouring, and attention to the general health, often prove sufficient to arrest the progress of this disease. If, however, it is neglected, abscess forms sooner or later. On cutting into this, and introducing the finger, the joint is discovered to be open; the head of the bone is found detached from the soft parts, and unsupported. Or this state of parts may be ascertained to exist by examination through a sinus, either with a probe, or with the finger after dilatation. In these circumstances, an attempt may be made to check disease, and preserve the arm, by excision of the obnoxious parts of the bone. And this kind of operation is also justifiable when the head of the humerus has been shattered by musket-shot; or when it has been exposed and injured by a splinter, or by a large shot, and the joint laid open. The situation and course of the incisions will be so far regulated by the openings or wounds already existing. They should always be made in the direction of the fibres of the deltoid, and the posterior aspect of the articulation is preferable to the anterior. One incision, from the back of the acromion process to near the insertion of the muscle, is sufficient to expose the head of the bone, to allow all its remaining attachments to be separated, and to admit of its being turned out so as to be conveniently acted on by the saw. The head of the bone merely is taken away. In separating the soft parts from its neck, the edge of the knife should be always directed to the bone, to avoid the nerves and vessels on the inside. In some cases of injury, very little additional wound may be requisite. The glenoid cavity may, in consequence of being seriously involved in disease, also require removal; this is best accomplished by large cross-cutting pliers. Few vessels require ligature. The edges of the wound are brought together; the elbow is supported, and the arm fixed to the trunk, in order to keep the bones in apposition, and prevent motion. This position must be retained during the rest of the cure; and when the wound is on the outside of the shoulder, as recommended, the dressing of it does not interfere with the retentive apparatus. The discharge gradually ceases, and cicatrisation is obtained, though not till after a considerable time, at least in general. The cut ends of the bones accommodate themselves to each other, and a sort of new joint is formed — but never strong. The motions of the forearm are perfect, though perhaps weakened; those of the upper arm are very incomplete. I have both performed and assisted in the operation repeatedly, and never experienced any difficulty; a cure has not always followed, but in some cases the limb has become very useful.

The *elbow-joint*, on account of its exposed condition, is generally regarded as the most favourable for excision. The affections of the joints of the upper extremity are much more manageable than those of the lower, and may generally be prevented from proceeding so far as to end in destruction of the apparatus. By care and good management, disease will be arrested, and the functions and motions of the parts restored and preserved; or the articulation may become stiff, and even though the anchylosis be complete, the limb will be very useful if the joint have been kept in a good position. The health, if previously undermined, is renovated, so soon as the local disease is arrested. But some bad cases are met with, in which all the parts surrounding the articulation are involved, and the strength wasted; in these amputation is the only safe and effectual procedure. It is only when the soft parts are not much diseased, when it is ascertainable that the affection of the bone is only to a limited extent, and when the usual means of cure have had a fair trial and failed, that excision is admissible. In determining on the operation, the time of life and the worldly circumstances of the patient are to be considered: a poor man requires his limb to be serviceable in labour; handsome appearance without utility is to him of no value. The motion and usefulness of the arm may be in a great measure preserved, if only a part of the bone of the arm, or a part of those of the forearm, entering into the articulation, be removed; but if large portions of all of these be taken away, the muscles will lose their support, the motions will never be restored to any extent, and the motion that is of it will be weak and vacillating, The joint will remain loose and powerless, and the limb will prove to be but a useless incumbrance. Such, at least, is the result of my experience on this subject; and I am sorry to add, that all which has been written on it is not deserving of unreserved belief. Many patients have, after long and severe suffering, preserved the arm to little purpose; others have been necessitated to submit to another operation — amputation after all; some have died after the first, others after the second mutilation. The operation is attended with no difficulty in execution, and this in some measure accounts for its frequent, and it is to be suspected, indiscriminate, performance of late years. The incisions are made on the posterior aspect of the joint. One is placed in the mesial line, extending from about two inches above the olecranon to the same distance below it; and from this flaps are raised, by making either a cross-cut in the middle, or one at each extremity; in the one case the flaps are four, and triangular; in the other two, and quadrangular; by either method the bones are readily exposed. A more simple form of incision, as described in the *Practical Surgery*, will often be found to suffice. The joint is opened and dislocated, and the soft parts separated to the necessary extent from the bones. The ulnar nerve is avoided by dissecting close to the bone. The diseased portions are then sawn off. The wound is closed, and the arm kept bent. This operation I have performed pretty often, the cases being carefully chosen for it, and the success has been highly satisfactory. By the sanguine supporters of this operation, the after-treatment is advised to be conducted so as to secure motion in the new articulation. From this I would dissent, for if the articulating ends of the bones have been actually cut off, the motion may be extensive enough certainly, but both joint and limb will be almost altogether impotent. It would be better to procure anchylosis in the bent position, than to have the arm dangling like a flail; in the one case the limb will be useful; in the other, ornament, and that too of an equivocal kind, is all that it can boast. Even anchylosis, in most cases, can be brought about only after the lapse of a long period. In the more severe affections of this joint, amputation of the limb is the operation which must ultimately be had recourse to, if the patient survive; and it is better to perform this at once, than after the experiment of excision has been tried and found wanting. I know that parents have too often had to regret and mourn bitterly their having departed from sound advice, and lent themselves to such experimental trials on their offspring.

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